July 5, 1949. M. CASSÉ 2,474,971

AUTOMATIC HOOD-FORMING MACHINE FOR HAT-MAKING

Filed Aug. 7, 1945 4 Sheets-Sheet 1

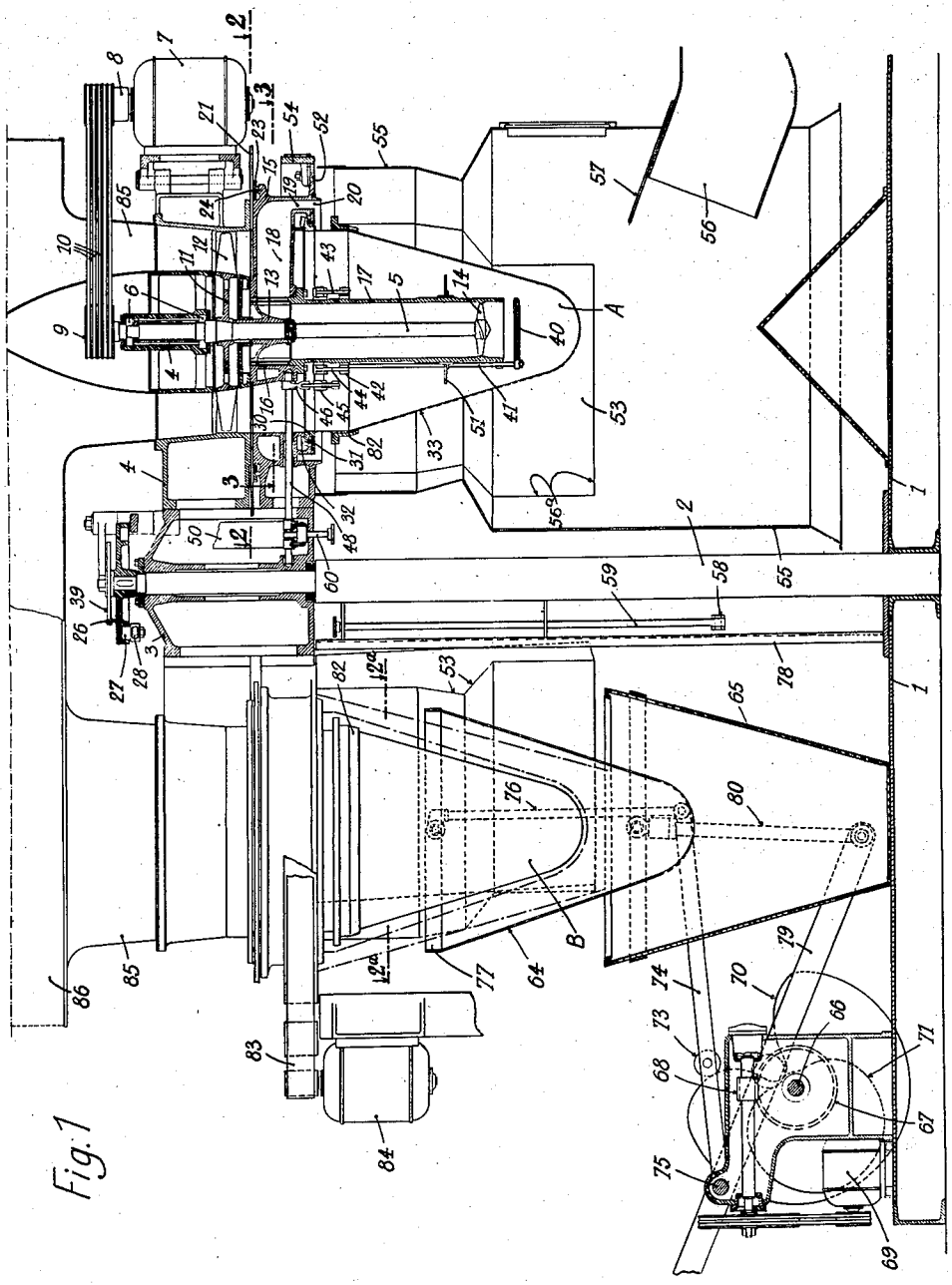

Fig. 1

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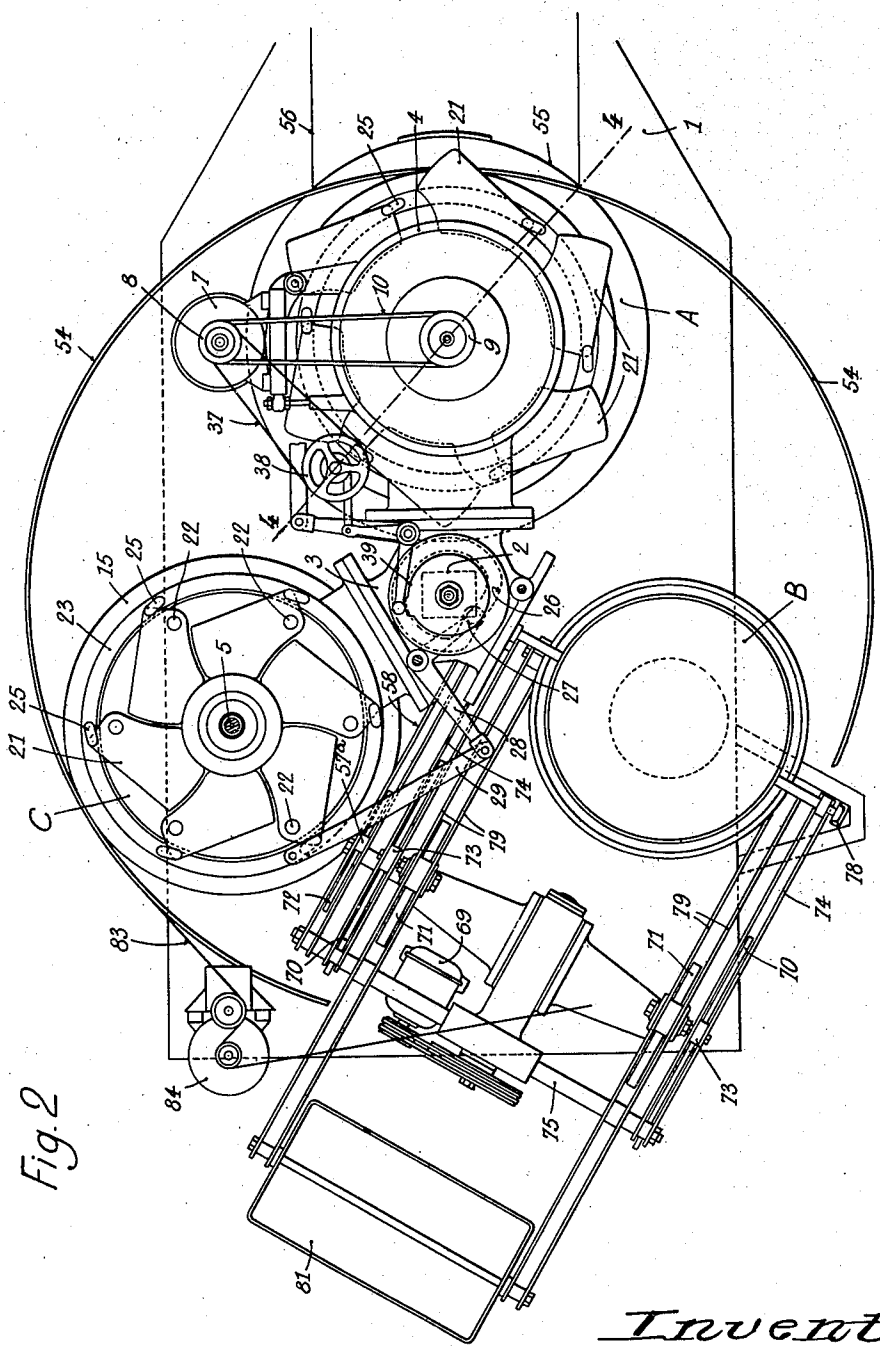

Fig. 2

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Fig. 3

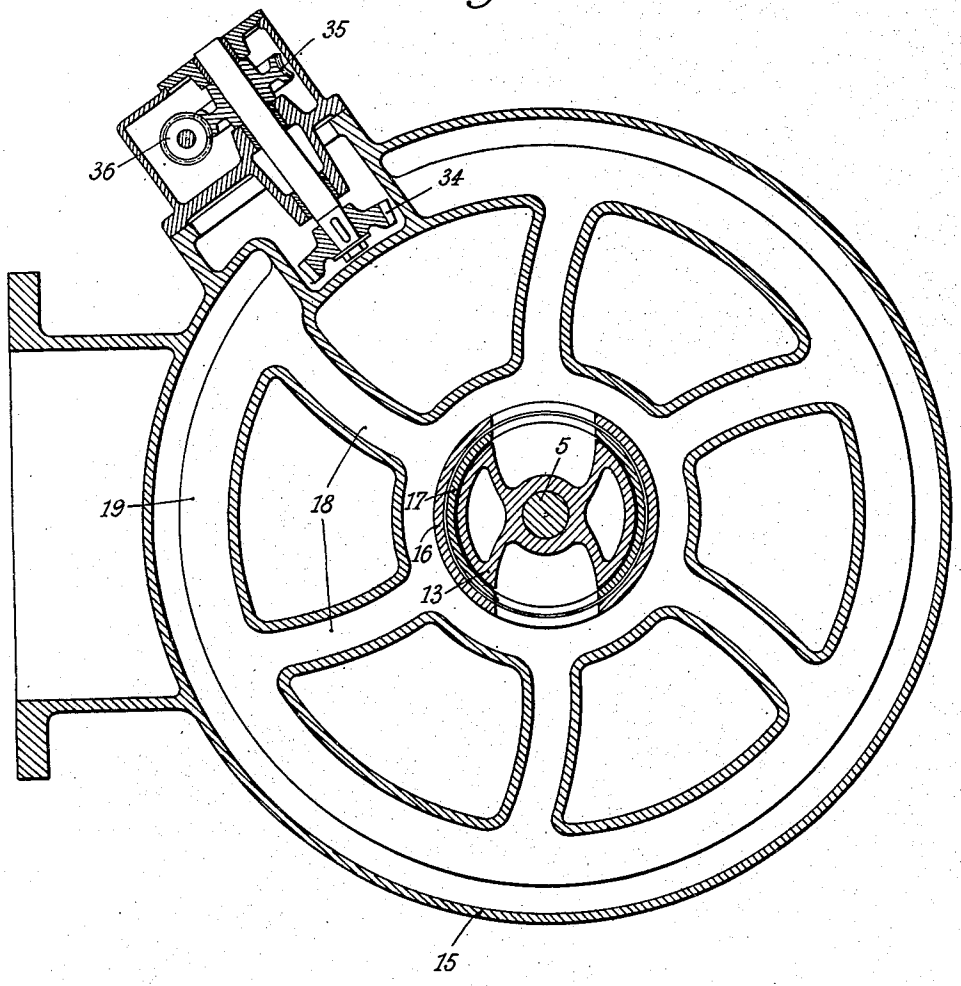

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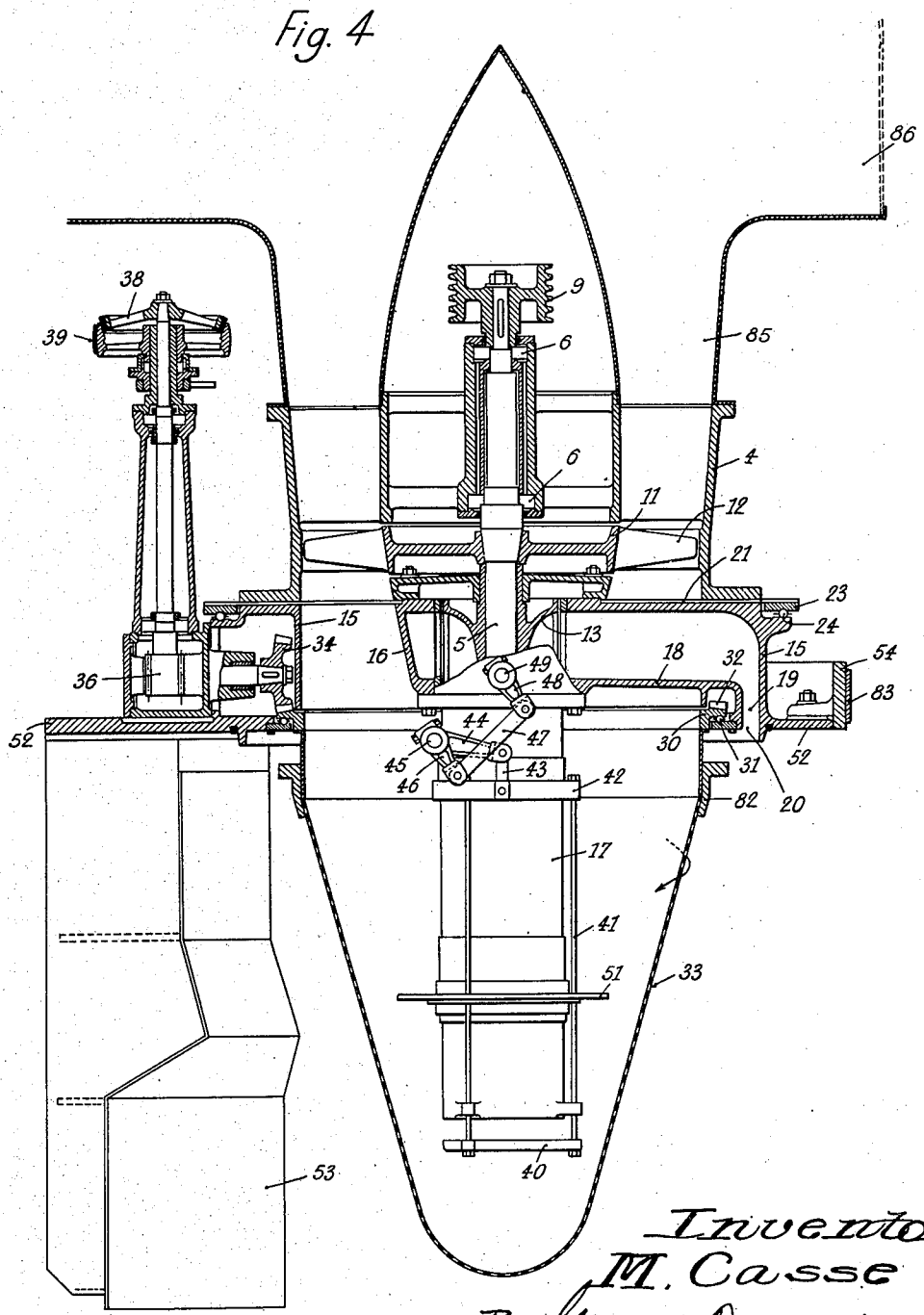
Fig. 4



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UNITED STATES PATENT OFFICE

2,474,971

AUTOMATIC HOOD-FORMING MACHINE FOR HATMAKING

Marcel Cassé, Essonnes, France

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In France April 27, 1943

Section 1, Public Law 690, August 8, 1946
Patent expires April 27, 1963

5 Claims. (Cl. 19—148)

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Known hood-forming machines for felt hatmaking essentially comprise a conical vat having a vertical axis, in which hair intended to constitute the felt hat is projected by an air stream against a removable perforated cone, placed on its base on a plate rotating in the vat. A circular opening arranged at the centre of said plate communicates by means of a pipe with a suction device. On the side of the cone, a water spraying pipe serves to dampen the air retained by suction on the perforated cone.

The hood-forming operation is effected in three phases; the hood-forming proper, the spraying and the manipulation of the cones. Said third operation consists in removing by hand the cone placed on the plate, replacing it by another cone and then turning the first cone upside down to make the hood fall out.

The machines for carrying out these operations present several drawbacks. Spraying within the vat causes projections of water on the walls of the vat; during the subsequent operations, said water can retain and agglomerate a few hairs; when said agglomeration of hairs grows to a sufficient extent it separates and falls on the hood, where it will subsequently constitute a defect in the hat.

Removing and repositioning the cones and turning them upside down are laborious operations, which can only be effected by strong and skilled workmen.

The apparatus which opens, separates and projects the hair, is not used during the operations of spraying and changing the cones.

On the other hand, the hood obtained simply by spraying has little firmness, is very fragile and necessitates a delicate operation of preliminary planking before final planking.

Finally, the spraying uses large amounts of hot water.

The invention has for its object to devise an automatic machine in which the above mentioned drawbacks are avoided and which permits of obtaining "pre-planked" hoods, that is hoods which simultaneously with their dampening are subjected to a preliminary effect of felting without the use of hot water.

The machine according to the invention comprises three units, each having an inverted perforated cone, hung by its base, and a fan, preferably of the axial type with direct suction, said three units being adapted to revolve about the central pivot of a revolving structure, so as to successively come opposite the hood-forming station, dampening station and hood-discharge station.

The hood-forming station comprises a vat in which opens an inlet conduit for air laden with hair, which latter is applied on the perforated cone by suction, as usual.

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The dampening station comprises a vertically movable water tank for the immersion of the hood-carrying cone.

Preferably, the dampening operation is associated with a pressing operation, for which purpose the water tank is fitted with means for causing a stream of hot water to apply the hood on the cone and with a device for causing periodical high frequency variations of the output of said stream, the impulses thus produced causing the hair to intermingle, i. e. a pre-planking of the hood.

Said water stream is preferably produced by a propeller keyed on the shaft of the fan, the periodical variations or interruptions of said stream being controlled by a rotary distributor, also keyed on said shaft.

The base of the perforated cone carries a ring, the fall of which causes stripping of the hood from the cone.

The machine also comprises various devices, described hereinafter solely by way of example, for controlling the displacements which bring the perforated cones in their three successive positions and cause rising and lowering of the tank containing the dampening water and the automatic operation of the various valves and obturators.

This automatic operation affords time saving, eliminates laborious efforts and avoids the necessity of exceptionally strong labour.

Further features of the invention will be disclosed in the following description, with reference to the accompanying drawings, given solely by way of example, and in which:

Fig. 1 is a view partly in elevation and partly in vertical section of an embodiment of the invention.

Fig. 2 is a plan view thereof, partly in section, according to line 2—2 of Fig. 1, parts being removed.

Fig. 3 is a cross-section according to line 3—3 of Fig. 1 and

Fig. 4 is a cross-section according to line 4—4 of Fig. 2.

Referring to the drawing, 1 denotes a base on which is secured a central column 2, at the upper part of which is pivoted a rotary head 3. On said rotary head 3 are secured three identical units, each comprising (Fig. 4): a first annular member 4, at the centre of which is mounted a vertical shaft 5, adapted to rotate in conical roller bearings 6, and driven by a motor 7 through the medium of pulleys 8 and 9 and belts 10. Said shaft carries, from top to bottom, a fan wheel 11, at the periphery of which are arranged blades 12 in the shape of airplane wings, constituting a helical fan, a rotary distributor 13, acting as a cock-plug and a propeller 14 (Fig. 1) acting as an axial pump.

A second annular member 15 (Fig. 4) comprises a hollow hub 16 through which extends a tube 17, the interior of which communicates with hollow arms 18, opening into an annular channel 19, at the periphery of member 15. Said channel 19 is provided at is lower part with a number of openings 20. On the surfaced upper face of arms 18 are slidably mounted obturating shutters 21 (Fig. 2). Said shutters, pivoted on spindles 22, are simultaneously controlled by a crown wheel 23, rotatable on a ring of balls 24, connection being made by means of links 25. Said crown wheel 23 is controlled by a fixed cam 26, through the medium of a cam follower 27 and levers 28 and 29.

Under the lower face of annular member 15 is arranged a crown wheel 30 (Fig. 4) rotatable on a ring of balls 31, and on the lower face of which is secured the hood-forming perforated cone 33. A set of conical teeth 32, cut in said crown wheel, meshes with a bevel pinion 34, driven by a helical gear 35 (Fig. 3) and a worm 36, which receives its movement from a motor 7 (Fig. 2) through the medium of a belt 37 and a clutch 38. Said clutch is controlled by a fixed cam 39.

A flap-valve 40 (Fig. 4), adapted to obturate the lower orifice of tube 17, is rigid with the lower ends of three rods 41, the upper ends of which are secured in a ring 42, adapted to be reciprocated along tube 17 under the action of a linkwork comprising links 43, levers 44 secured on a shaft 45, a lever 46, a link 47, a lever 48 and a horizontal shaft 49. A counterweight 50 (Fig. 1) secured to said shaft 49, normally urges flap-valve 40 upwardly to obturate the lower opening of tube 17.

Tube 17 carries a removable vertically adjustable disc 51.

The lower face of annular member 15 is constituted by a plate 52, on which are secured depending doors 53 (Fig. 1 and 4) and a ring 54.

The three units are identical with the one just described: each of them successively occupies the following positions: hood-forming position A, dampening position B, hood discharging position C (Fig. 2).

In the hood-forming position A, the unit enters a vat 55 (Fig. 1) formed with gates or apertures 56*a*, the shape of which is complementary to that of the doors 53, secured to plate 52, so that, in this position, the wall of the vat is completed throughout its periphery, the inner face of said doors 53 joining with the inner surface of the vat 55. At the lower part of vat 55 opens a channel 56 for admitting the hair. The mechanism for projecting the hair, is of a well-known construction and has not been illustrated. It will simply be reminded that it comprises an endless band on which is distributed the weight of hair corresponding to a hat. This hair is taken up by two supply rolls and brought in front of a first picker. The hair is untangled and applied on a rotary drum, from which it is taken up by two feeders. The hair is then projected by a second picker against a "brush" and then through channel 56. A sliding tongue 57 forms an adjustable extension of the upper part of said channel 56.

The angular setting of fixed cam 26 is such that, in said hood-forming position A, the shutters 21 are spaced away or open (Fig. 2) and that of cam 39 is such that clutch 38 is in the "on" position, thus transmitting the movement of rotation of the motor to crown wheel 30 and to perforated cone 33.

Flap-valve 40 is closed under the action of counterweight 50.

The operation of the unit, which is in hood-forming position A, is as follows: as the perforated cone 33 reaches the centre of vat 55, two of the doors 53, secured to the lower part of plate 52, obturate the two lateral gates of said vat 55; the hair distributor is set in operation and the hair is projected into vat 55. Said hair follows the air stream created by the helical fan 11—12 and is applied on the perforated cone 33, which is rotated as above explained. Adjustment of the thickness of the hair layer at different parts of the hood is effected in a known manner, both by admission of air at the upper part and at the sides of the vat 55, by the position of tongue 57, and by the position and the diameter of disc 51.

In position B (immersion), the unit carrying the hood is brought above a mechanism comprising: a perforated counter-cone 64 (Fig. 1), a tank 65 full of hot water, a cam shaft 66, driven through a helical wheel 67 and a worm 68, by a motor 69. On either side of shaft 66 are rigidly secured two similar cams 71 adapted to control lifting of tank 65 and two cams 70 adapted to control lifting of the perforated counter-cone 64. A cam 72 (Fig. 2) secured on shaft 66, is intended to control the flap-valve 40 of each of the units (Fig. 1). For that purpose, said cam 72 actuates a cam follower 57*a* carried by a lever 58 (Figs. 1 and 2), adapted to lift a rod 59 arranged below a push-piece 60, rigid with counterweight 50.

The cam followers 73 cooperating with cams 70 are carried by levers 74, rocking about a fixed spindle 75, and pivoted at their end upon levers 76 which are pivoted in turn on a ring 77 carrying the counter-cone 64. The rising movement of said counter-cone 64 is guided by vertical slideways 78 (Fig. 2). Likewise, the lifting of tank 65 is ensured by levers 79 and links 80, a counterweight 81 partly balancing the weight of the tank and of the water contained therein.

In said "immersion" position B, shutters 21 remain open, but the movement of rotation of crown wheel 30 and of perforated cone 33 is stopped under the action of cam 39 which brings the clutch in the "off" position.

Flap-valve 40 progressively opens under the action of cam 72, when tank 65 reaches its upper position.

The operation, in said immersion position B, is as follows: Motor 69 being set in action, shaft 66 executes half a revolution, whereafter it automatically stops. Cams 70 rapidly lift the perforated counter-cone 64, whereupon cams 71 slowly lift tank 65. The hair deposited on the perforated cone 33 is thus immersed into the hot water contained in the tank and the counter-cone 64 prevents the effect of eddies on the position of the hair. When the hood is immersed, cam 72 causes flap-valve 40 to open. Under the action of propeller 14, the hot water is caused to flow from the inside of cone 33, back into the tank, at the outside of counter-cone 64, through tube 17, valve plug 13, hollow hub 16 and arms 18. The stream of water thus created, which causes the hair to firmly adhere to cone 33, is periodically interrupted owing to the rotation of valve plug 13. In the present embodiment, said plug is formed with two openings, so that interruptions of the circulation are set up twice per revolution of shaft 5. The periodical "hammering" or impulses in the water stream passing

through the hair retained on the perforated cone, cause the hair to intermingle and produce a sort of preliminary planking.

Tank **65** is then slowly lowered, flap-valve **49** progressively closes and counter-cone **64** moves down in turn. As the cone emerges from the water of tank **65**, the hood is still subjected to the action of the helical fan **11—12**, whereby it adheres to the perforated cone and is partly dried.

In the third position C (removal of the hood), perforated cone **33** overhangs a table (not shown) and lowering of ring **82**, located at the base of perforated cone **33**, facilitates the removal of the hood.

The three units above described are surrounded by a large ring **54**, engaged by a belt **83**, driven by a motor **84**.

The current is supplied to the three motors **7** by means of conductors (not shown) located within the column and connected to slip rings carried by said column, said slip rings being in contact with brushes carried by the rotary head **3**.

The motors **69** and **84** are controlled by a system (not shown) of contactors, electromagnets and switches actuated by projections carried by the movable parts of the machine and so arranged that the circuits of the motors cannot be closed simultaneously for the two motors and are closed and open in due time in order to control the stopping and the starting of the movable parts in the three successive positions A, B, C.

The delivery conduits **85** of the helical fans **11** and **12** open into a hair collecting chamber **86**, the walls of which are provided with a fine network, and in which is collected the hair which may have passed through the perforations of cone **33**. It will be noted that one advantage of the machine is the recovery of dry hair, whereas the hair recovered in known machines is wet and therefore nearly valueless.

The operation of the whole structure will be understood from the foregoing description: the hood-forming operation takes place as above described. Once the amount of hair necessary for the hat entirely deposited on the cone, the operator unlocks the large ring **54** and sets motor **84** in action. The latter drives the whole rotary upper structure through ⅓ revolution. The perforated cone **33**, lined with hair, moves to the "immersion" position above and in the axis of tank **65**.

The immersion takes place in the manner described, then the whole rotary structure again revolves by one third of revolution and moves to position C (removal of the hood). Shutters **21** close under the action of cam **26**. The operator then causes ring **82** to suddenly fall, whereby the hood falls onto the table.

It is obvious that the two further cones follow the same cycle of operations.

Of course, the invention is not limited to the constructional details above described, which have been given only by way of example.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. An automatic hood-forming machine for hat-making comprising in combination a central vertical pivot, a revolving structure adapted to turn about said pivot, three identical units depending from said structure, each comprising an inverted perforated cone and a fan adapted to suck air therethrough from the outside to the inside, a hood-forming station embodying a vat adapted to be supplied with a stream of hair-laden air, a dampening station embodying a water tank and a hood removing station where the hood is stripped from the perforated cone, each unit being adapted to revolve from one station to the other and to rest therein for the achievement of the corresponding operations, means for moving said water tank up and down, from an idle lower position to a raised operative position where said cone is immersed into said water tank.

2. An automatic hood-forming machine for hat-making comprising in combination a central vertical pivot, a revolving structure adapted to turn about said pivot, three identical units depending from said structure, each comprising an inverted perforated cone and a fan adapted to suck air therethrough from the outside to the inside, a hood-forming station embodying a vat adapted to be supplied with a stream of hair-laden air, a dampening station embodying a water tank and a hood removing station where the hood is stripped from the perforated cone, each unit being adapted to revolve from one station to the other and to rest therein for the achievement of the corresponding operations, means for moving said water tank up and down, from an idle lower position to a raised operative position where said cone is immersed into said water tank, means for setting up a stream of water through said cone, a perforated counter-cone and means for moving said counter-cone up and down, from an idle lower position to a raised operative position, where said counter-cone covers the hood on said cone and protects same from water eddies.

3. In a hood-forming machine for hat-making, an inverted perforated cone, a water tank means for immersing said cone in said water tank, means for causing a stream of water to flow through said perforated cone from the outside to the inside, and means for periodically varying the flow of said water stream at high frequency, to cause pre-planking of the hood on said cone.

4. In a hood-forming machine for hat-making, an inverted perforated cone, an axial shaft, and axial fan keyed on said shaft and adapted to suck air through said perforated cone, from the outside to the inside, and a propeller pump keyed on said shaft and adapted to suck water through said perforated cone from the outside to the inside.

5. In a machine as claimed in claim 4, a rotary distributor keyed on said shaft for periodically varying the output of said propeller pump.

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