W. FISHER.

MACHINERY FOR WAVING AND CRIMPING HAIR AND OTHER FIBROUS MATERIAL.

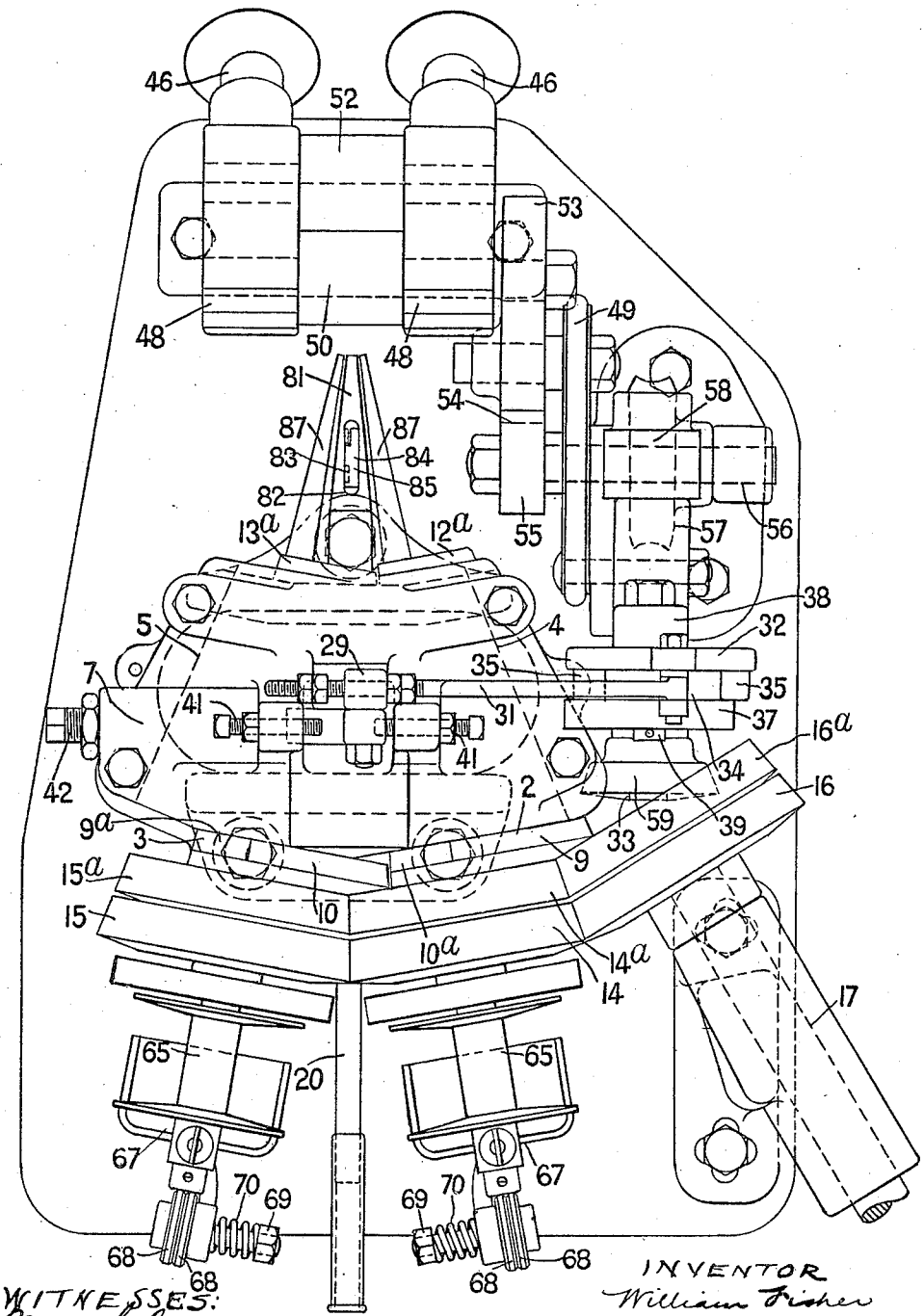
APPLICATION FILED FEB. 21, 1911.

1,067,103.

Patented July 8, 1913.

3 SHEETS—SHEET 1.

FIG. 1.



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3 SHEETS—SHEET 2.

FIG. 2.

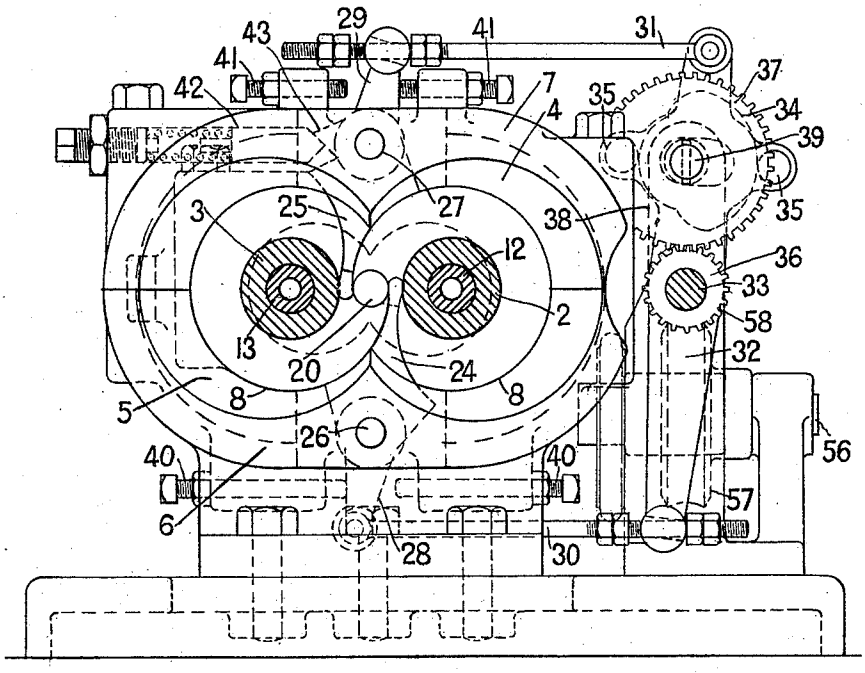


FIG. 3.

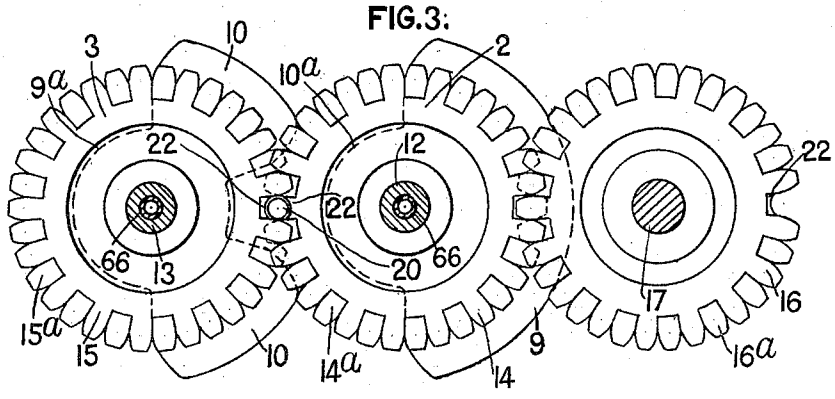


FIG. 6.

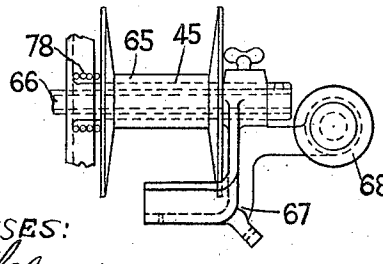
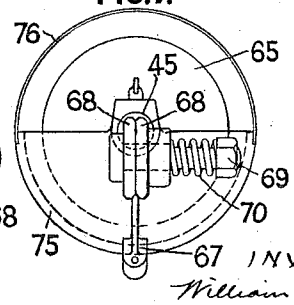


FIG. 7.



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3 SHEETS—SHEET 3.

FIG.10.

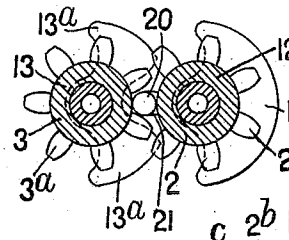

FIG.4.

FIG.5.

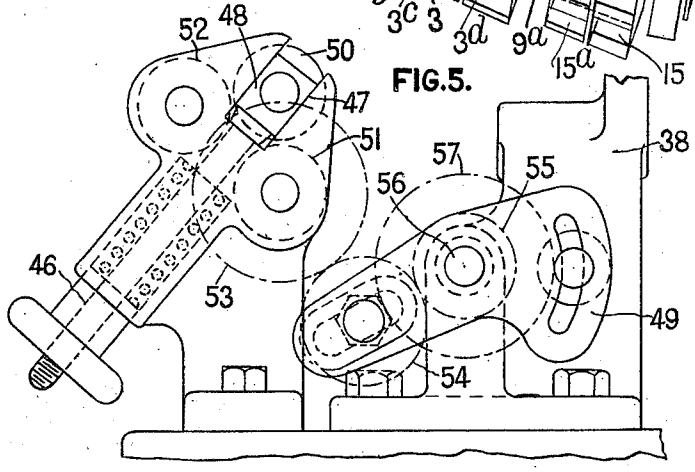

FIG.8.

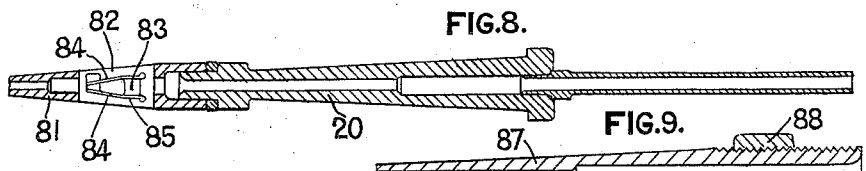

FIG.9.

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MACHINERY FOR WAVING AND CRIMPING HAIR AND OTHER FIBROUS MATERIAL.

1,067,103. Specification of Letters Patent. Patented July 8, 1913.

Application filed February 21, 1911. Serial No. 609,894.

To all whom it may concern:

Be it known that I, WILLIAM FISHER, a subject of the King of Great Britain, residing at 27 Farfield Terrace, Manningham, Bradford, England, have invented new and useful Improvements in and Relating to Machinery for Waving or Crimping Hair and other Fibrous Material, of which the following is a specification.

This invention relates to improvements in that type of machine described in British specifications No. 2487 of 1874 and No. 16339 of 1899, for waving or crimping hair and fibrous material in which the material is wound or wrapped alternately around two cords or cores preparatory to steaming and drying or otherwise treating it and the cores are subsequently withdrawn leaving the material in a waved or crimped form, and the object of this invention is to provide a cheap, durable and compact machine of the above type to run faster and smoother and also to facilitate the duplicating of its parts.

In the accompanying drawings Figure 1 represents a plan view of a waving or crimping machine of the above type with my improvements applied thereto. Fig. 2 is a back view of the same showing the cone gears in section on the broken line *a. b.* Fig. 4, the circles 8 representing the path of the extreme edges of the teeth of the bevel wheels 2^b and 3^b. Fig. 3 is a back view of the bevel wheels for driving the cones. To facilitate drawing the same the wheels are shown with their axes parallel to each other. Fig. 4 is a plan view of the cone gears, one being shown in section and the other partly in section with the hollow spindle carried around with the cone gears shown passing through in between them. Fig. 5 is a side view of the drag rollers and their connecting mechanism. Figs. 6 and 7 are two views at right angles to each other of one of the two creels or spools for carrying the core bands or cords with its guiding and tension devices. Fig. 8 is a longitudinal section of the hollow spindle for conveying the hair or fibrous material. Fig. 9 is a longitudinal section of an adjustable tubular projection for carrying forward to the end of the spindle the core cord. Fig. 10 is a cross section on the broken line *c. d.* Fig. 4 looking from the back of the machine.

To carry out my invention I employ two sets of bevel wheels the envelops of which are in the form of two truncated cones 2 and 3 truly mounted with their axes in the same plane in two corresponding conical bearings 4 and 5 respectively formed either in one casting or in two pieces, the pedestal 6 and the cap 7. The bevel wheels 2^a, 2^b, 2^c and 2^d of the truncated cone 2 are in gear with the bevel wheels 3^a, 3^b, 3^c and 3^d respectively of the truncated cone 3. The cones are driven by the pairs of bevel wheels 14, 14^a and 15, 15^a formed or secured at the back of the cones 2 and 3 respectively, the pair 14, 14^a being driven by the pair of bevel wheels 16, 16^a respectively on the driving shaft 17 provided with fast and loose pulleys not shown in the drawings. The wheels comprising each truncated cone and its driving pair of bevel wheels are so arranged and cast or secured together on the same axis that the teeth in any one wheel are opposite to the spaces between the teeth of the wheels immediately in front and rear of such wheel. To confine the cones longitudinally in their bearings 4 and 5 the cone 2 is made with a flange 9 and a groove 10^a interlocking with a groove 9^a and a flange 10 respectively on the other cone 3 and with both flanges engaging the back ends of the bearings 4 and 5 and similar shaped flanges 12^a and 13^a secured to the ends of the sleeves 12 and 13 upon which the cones are mounted and which engage the front ends of the bearings 4 and 5. The usual hollow spindle 20 is employed to convey the hair or material between and alternately around with the cones in opposite directions to the point where it is wound alternately around the two cords or bands which subsequently form the two cores of the plait.

The spindle is mounted in a groove formed between the teeth of alternate wheels and the remaining portions 21 of the cut away tooth of the others in its respective cone, the wheels being so arranged as above described as to permit of this. The teeth between which the hollow spindle passes carry such spindle between and alternately around the cones in opposite directions carrying the hair or fibrous material in a zig-zag manner around the cords or bands, that is to say, around the cores of the plait. On each truncated cone the alternate toothed wheels each have a tooth cut out, all the spaces thus formed being in alinement, thus forming together with the spaces between the teeth on the remaining wheels in alinement with the spaces formed by cutting out said tooth, a

groove extending the length of the cone. The wheel 16[a] is similarly constructed and the groove extends through the portions 10 and 13[a]. The spindle which is slightly tapered is confined within the tubular space formed by its groove in each cone and the conical bearing surface of its respective cone and such spindle fits said tubular space along more or less its entire length. The remaining portion of the cut away tooth of each pair of bevel wheels 14, 14[a] and 15, 15[a] and 16, 16[a] and alternate wheels in gear forms a bearing or support 22, Fig. 3, for the hollow spindle 20.

By making the teeth of alternate wheels of each cone and its driving pair of wheels opposite to the spaces in the other wheels the alternate wheels of each cone having cut away teeth are evenly divided between the pair of cones thus facilitating smoothness in gearing and to balance same the wheels comprising the truncated cones are located at each end of the cones allowing sufficient room between same for the working of the switch pieces 24 and 25 for guiding the spindle from one cone to the other. The bevel wheels forming the truncated cones 2 and 3 are shown in the drawings as having seven teeth each this being a convenient number to allow the usual spindle 20 to pass between the spaces of the teeth.

The spindle 20 is transferred from one cone to the other by means of switch pieces 24 and 25; the spindle carried around in its groove by the teeth at each side of same is allowed to pass and is guided from one cone to the other in opposite directions by said switch pieces which are moved in opposite directions between the cones against the sides of same. In the present invention these switch pieces are operated from the outside of the apparatus independently of the spindle. The switch pieces 24 and 25 pivoted at 26 and 27 respectively are actuated by their arms 28 and 29 and connecting rods 30 and 31 pivoted to each end of the rocking lever 32 loosely mounted on the short shaft 33 and rocked by the cam 34 working between anti-friction rollers 35 on said lever. The cam 34 is worked from the shaft 33 through the spur wheel 36 on said shaft 33 gearing with the spur wheel 37 secured to the cam 34 and pivoted to the bracket 38 by the stud 39. The switch pieces 24 and 25 are limited by the adjustable screws 40 and 41 to movement into position to guide the spindle from one cone to the other before the spindle reaches them. An adjustable spring detent 42 engages either side of the double inclined projection 43 formed at the side of the upper switch piece 25 and retains it in position after each movement. The inner faces of the switch pieces at their ends are cut away to allow them to pass each other in the same plane.

When the hair is wound on the cords or cores it is then passed through drag rollers in the form of a plait to be dealt with in any convenient way. The drag arrangement consists of an upper spring pressed roller 50 and two bottom rollers 51 and 52 which are geared together at one end and the rollers may have their peripheries milled or fluted. The rollers are driven by the interchangeable wheel 53 on the shaft of the roller 51 in gear with the intermediate stud wheel 54 carried by the swing arm or bracket 49 pivoted to the bracket or standard 38, the said wheel 54 gearing with another wheel 55 secured on the same shaft 56 as the worm wheel 57 which latter is driven by the worm 58 of the shaft 33 driven from the driving shaft 17 by means of the bevel wheels 59 and 60. The press roller 50 is preferably not in contact with the bottom rollers but is separated sufficiently from same to facilitate the material entering between the rollers, this may be accomplished by the sliding blocks 48 carrying the shaft of the roller 50 resting against the bottom of the slots or guides 47 with the roller 50 not in contact with the bottom rollers but sufficiently clear to allow this. The adjustable spring screws 46 serve to give the desired nip or grip to the plait passing through the rollers.

Each creel or spool 65 for carrying the core cord is mounted on a hollow sleeve 45 mounted on the hollow spindle 66 co-axial with its cone, within each of the sleeves 12 and 13. Each creel or spool is provided with a guide or flier 67 similar to that used in spinning machinery for winding the weft onto the bobbin after it has been spun but in the present invention this is opposite, *i. e.* for unwinding the band from the spool and conducting it through the center of the spool. Hitherto in this type of machine the creel or spool has been placed with its axis at right angles to the axis of the cone and not co-axial with same as in this invention and the band has been pulled directly off the spool hence it was essential for the band to be wound tight and even on the spool and the spool was braked sidewise to get the necessary tension which was regulated by the operator at intervals. It is evident by this arrangement there is no guarantee of regularity of tension on the band because it may be pulled slack and tight in places but in my arrangement the spool may be supplied with core band in a more or less careless condition because I unwind it as specified and pass it between tension disks 68 similar to those used on a sewing machine and which are regulated by the nut 69 and spring 70, hence the tension is regular during the unwinding of a complete spool; this also allows of a larger spool being used.

The flier is held stationary and prevented

from rotating around the axis of the cone by its own weight and such flier may be formed with a semi-circular part 75 to which a light cover 76, Fig. 7, is detachably secured. A spiral spring 78 in compression which presses against the rear end of each spool, Figs. 4 and 6, is used with advantage to prevent the spool from overrunning.

To regulate the tension of the hair passing out of the spindle 20 I provide a series of tension devices 85 of different strengths any one of which may be inserted in a slot 82 formed in the tapering end 81 of the spindle 20. The device 85 consists of two springy arms 84 for nipping or gripping the hair passing between same the said arms being connected together by a separating piece 83.

The core cords passing through the cones are carried forward to the end of the spindle by the axial tubular projections 87. Fig. 9 shows an adjustable form of one of these tubular projections on a larger scale provided with a locking nut 88 thus facilitating duplication as they may be made to stock and adjusted to the length of the hollow spindle for conveying the hair or fibrous material.

The spools may be made in ordinary casting and simply bored and put on loose and all the gears being cut from one set of patterns it follows that when the parts are machined to size they will have the same relative position to each other.

The operation of the machine is as follows: The sliver of hair or fibrous material is passed through the hollow spindle 20 through one of the series of tension devices 85 and out at the front tapering end 81 of such spindle to feed through the drag rollers 50, 51 and 52. After the bands or cords are wound on the bobbins 65 each one is threaded through guide holes in the stationary flier and passed between the tension disks 68. The bobbins are then placed in position on the ends of the hollow spindles 66 preferably with the ends of the bands hanging inward, *i. e.*, toward the center of the machine. The bands are then drawn through the hollow spindles 66 of the cones and out through the tubular projections 87 the tension being applied and regulated to the bands or cords by the nuts 69. After the sliver of hair and the bands have been drawn through their respective hollow spindles they are drawn through the drag rollers 50, 51 and 52. This is done by releasing the pressure from the top roller 50 and raising such roller sufficiently to allow the sliver and bands to pass between same and the bottom rollers. As these rollers are never in actual contact it will be only necessary to attend to the drawing off after the full thickness of plait has been drawn through the rollers.

When altering the machine for various thicknesses of sliver it is only necessary to alter the change wheel 53 on end of roller 51 provision being made for this by the swing arm or bracket 49 which carries the intermediate wheel 54. In changing from one thickness to another, say, for example, from thin to thicker sliver, it is always advisable that the speed of the rollers should at first exceed the demand therefore a wheel should be used that will accelerate the speed of the rollers afterward reducing this speed by means of a larger wheel until the plait is of the required closeness. The object is in getting the machine running to insure that the sliver is cleared through the rollers quickly enough as if running too slowly an unnecessary amount of trouble may arise through the breaking of the bands or cords.

Claims:—

1. In machinery for waving or crimping hair and other fibrous material of the type described, a pair of intermeshing truncated cones each comprising a plurality of beveled toothed wheels arranged with the teeth of alternate wheels opposite to the spaces between the teeth in the other wheels and with a tooth of each alternate wheel of each cone cut away to form a longitudinal groove in each cone, a hollow spindle adapted to engage said grooves, said grooves being brought into alinement once on each rotation of the cones for conveying the hollow spindle around with the cones, substantially as described.

2. In machinery for waving or crimping hair and other fibrous material of the type described, the combination of a pair of intermeshing truncated cones each comprising a plurality of beveled toothed wheels arranged with the teeth of alternate wheels opposite to the spaces between the teeth in the other wheels and with a tooth of each alternate wheel of each cone cut away, and toothed driving wheels arranged in pairs on each cone with the teeth in one of each pair opposite to the spaces in the other of the same pair and with one tooth in each pair of wheels cut away, the spaces formed by cutting away said teeth and the alined spaces in alternate wheels forming a longitudinal groove in each cone, a hollow spindle adapted to engage said grooves, said grooves being brought into alinement once on each rotation of the cones for conveying the hollow spindle around the cones, substantially as described.

3. In machinery for waving or crimping hair and other fibrous material of the type described, the combination of a pair of intermeshing truncated cones each comprising a plurality of beveled toothed wheels arranged with the teeth of alternate wheels opposite to the spaces between the teeth in the other wheels and with a tooth of each alternate wheel of each cone cut away to form a lon-

gitudinal groove in each cone, a hollow spindle adapted to engage said grooves, said grooves being brought into alinement once on each rotation of the cones for conveying the hollow spindle around with the cones, and switch pieces and means for operating said switch pieces independently of the hollow spindle, said means comprising arms connected with the switch pieces, rods connected with the arms, a rocking lever joining said rods provided with anti-friction rollers and a rotatable cam for acting on said rollers, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM FISHER.

Witnesses:
CECIL A. S. BAXTER,
CECIL RHODES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."