May 4, 1926. 1,583,587

M. F. FLYNN

MACHINE FOR NAPPING FABRICS

Filed June 4, 1925 2 Sheets-Sheet 1

Fig. 1.

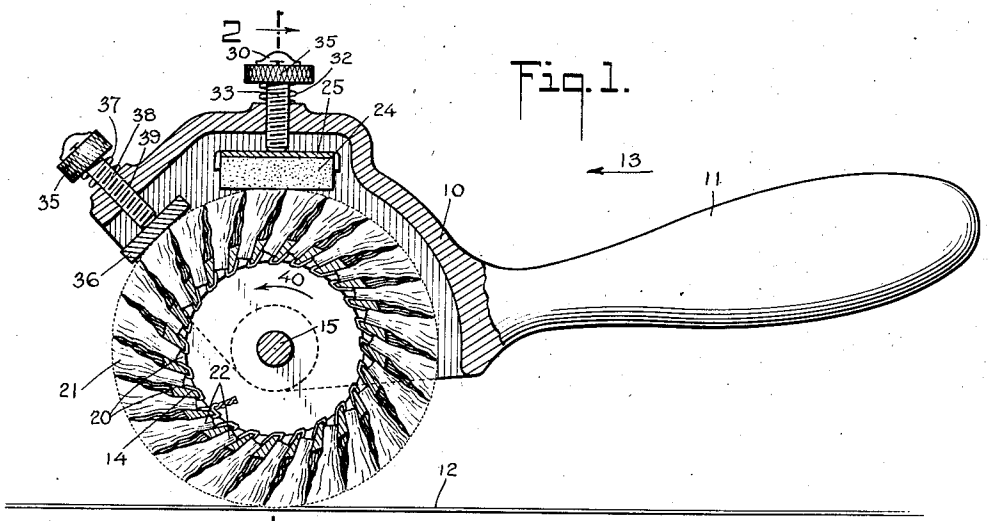



Fig. 2.

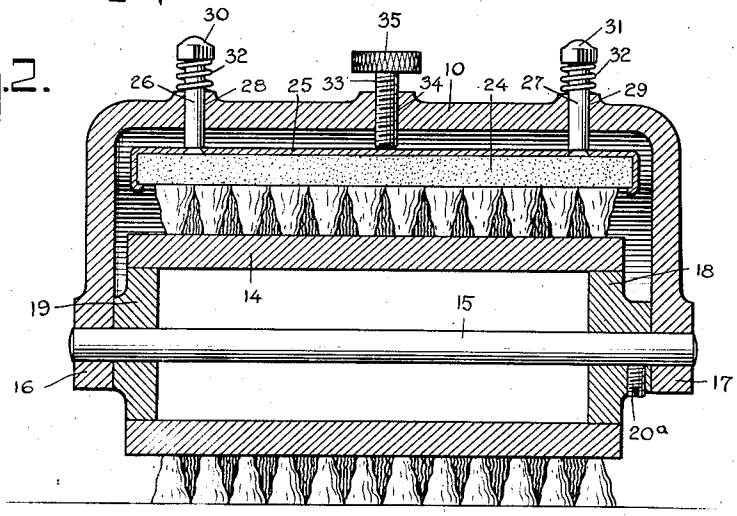
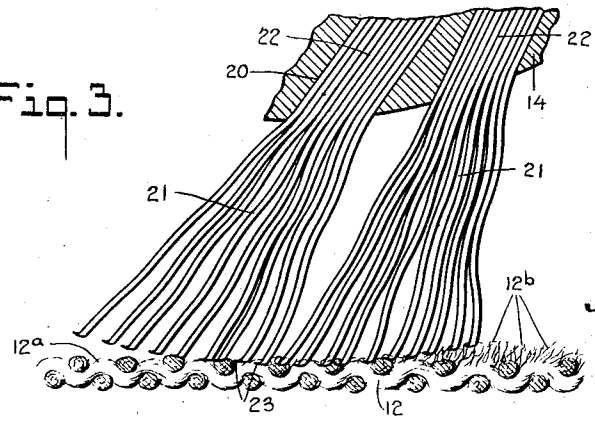



Fig. 3.



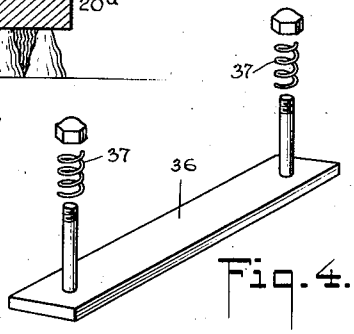




Fig. 4.

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Fig. 5.

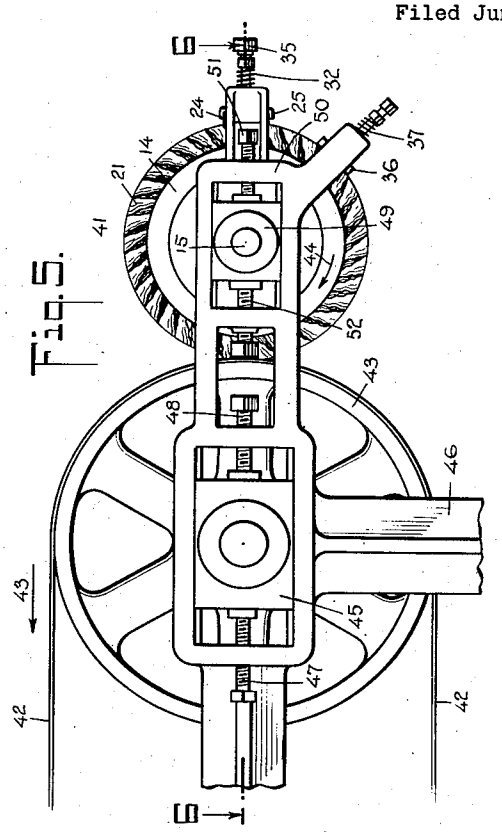


Fig. 6.

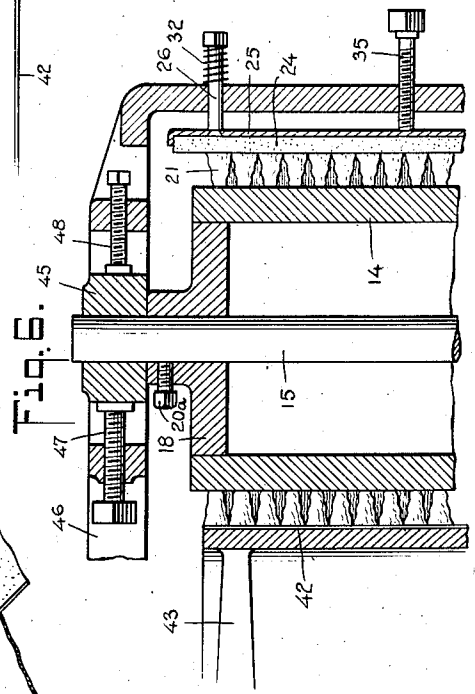
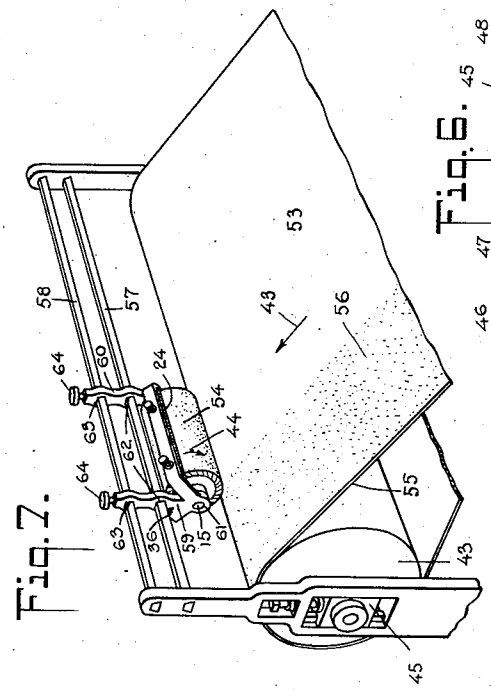


Fig. 7.



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Patented May 4, 1926. 1,583,587

# UNITED STATES PATENT OFFICE.

MORTIMER F. FLYNN, OF WEST NEW BRIGHTON, NEW YORK, ASSIGNOR TO NEW NAP SYSTEM, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## MACHINE FOR NAPPING FABRICS.

Application filed June 4, 1925. Serial No. 34,811.

*To all whom it may concern:*

Be it known that I MORTIMER F. FLYNN, a citizen of the United States of America, residing at county of Richmond, West New Brighton, Staten Island, State of New York, have invented certain new and useful Improvements in Machines for Napping Fabrics, of which the following is a specification.

This invention relates to the improved means for napping or re-napping fabrics and the like in the piece or made up into garments.

An object of the invention is to overcome the serious defects arising in the use of prior art napping brushes, namely, the dulling of the points of the burrs at the ends of the bristles, the changing of the angle of the burrs to the bristles, or of the angle of the bristles relative to the hub of the brush and the breaking off of the burrs, any or all of which defects give rise to commercially unsatisfactory results. My invention provides in a positive manner and by positive means the substantial correction of the above stated and other defects and rectifies any or all of the above stated defective conditions substantially immediately upon the arising of the defects.

My invention is carried out either in the manual propulsion type of my napping machine upon a fabric positioned upon a table or other suitable support or in the type of my napping machine in which the napping cylinder is mounted on a stationary support in proper relation to the fabric which is drawn by suitable rollers over a predetermined path of travel and in contact with the napping cylinder. In both forms of my invention the napping is performed in a continuously uniform and regulatable manner.

Pursuant to the preferred forms of my invention as applied for manual propulsion, the same comprises a casing serving as a housing and having a handle to afford manual manipulation, a napping cylinder formed of wire bristles firmly supported at their fixed ends in a suitable roller in a certain angular relation to the radial direction of the roller. The free ends of the bristles are provided with burrs projecting in a predetermined relation to the body of the napping cylinder. The shaft of the roller is freely mounted in the casing and affords free rotational movement of the roller. In suitable relationship with the free ends of the bristles, I arrange suitable abrasive means for the purpose of retaining the burrs at the ends of the wire bristles and to maintain the predetermined relation of the burrs to the bristles and in a certain relation to the fabric to be napped whereby the desired penetration by the ends of the wire bristles and the burrs thereon, within the body of the fabric is attained at the stage of initial contact of the bristles with the fabric and the proper inclination or angles of the burrs at the stage of release by the bristles of the material of the fabric to thereby raise the fibres of the thread of the fabric above the effective surface of the fabric to produce a uniform nap or to re-nap the same in an even or uniform manner.

The tufts of bristles are arranged relative to the roller to distribute the ends of the bristles uniformly about the effective periphery of the resulting cylinder.

The abrasive may be in the form of a bar having one of its flat faces positioned to engage the ends of the wire bristles. The abrasive bar is preferably mounted in the frame to be adjustable relative to the periphery of the wire bristles to regulate the pressure of the abrasive on the wire bristles and to compensate for wear of the bristles.

Additional means are also provided for effecting the restoration of the alignment of the wire bristles in the event of the displacement of the same incident to the napping operation, and also for removing any serrations on the flat faces of the burrs which may arise by the action of the abrasive and thus prevent such serrations from cutting or unduly tearing the fibres of the thread comprising the fabric. Such additional bristle rectifying means may be in the form of a flat bar of steel or other suitable material and is preferably adjustably mounted within the casing.

The abrasive serves also to rectify the bristles in the event of the bending or other distortion of the bristles and of the burrs.

This application is a continuation in part of my pending application filed by me on the 22nd day of July, 1924, entitled Textile napping machines and bearing Serial Number 727,441.

Further features and objects of the invention will be more fully understood from the following detail description and the accompanying drawings, in which—

Fig. 1 is a central vertical section of a manually operated type of napping machine embodying my invention;

Fig. 2 is a sectional elevation on line 2—2 of Fig. 1;

Fig. 3 is a detail view on a greatly enlarged scale showing the manner of assembly of the tufts of wire bristles on the supporting roller, the angular position of the fixed ends of the bristles in the roller and the crinkled wire preferably used for the bristles;

Fig. 4 is a perspective view of the bristle rectifying bar;

Fig. 5 is a detail vertical elevation of the napping portion of a machine for napping fabrics or re-napping the same by the propulsion of the fabric relative to the napping cylinder rotably mounted on a stationary support;

Fig. 6 is a sectional elevation on line 6—6 of Fig. 5; and

Fig. 7 is a perspective view showing a multi-stage form of my invention.

Referring to Figs. 1 and 2, the casing 10 is of any suitable form and is made of metal or other suitable material which may be cast or otherwise shaped of the desired contour. The casing 10 is provided with a handle 11 for pushing the napping machine over the fabric 12 in the direction of the arrow 13, see Fig. 1 to produce a nap or to re-nap the same.

The roller 14 is rotatably mounted on its shaft 15. The shaft 15 is of any suitable form such as the cylindrical rod journalled at its opposite ends in suitable bearings in the sides 16, 17 of the casing 10. The roller 14 may be formed of a hollow cylindrical annulus of wood or other suitable material; the roller 14 is mounted on the oppositely disposed circular disks 18, 19, the central openings of which receive the body portion of the shaft 15. The shaft 15 may be secured to one of the disks 18, 19 by a set-screw $20^a$. Such hollow formation of the roller affords convenience in locating the perforations 20 in the roller 14 and in positioning the fixed ends of the tufts 22 of the bristles 21 and tying the same in firm anchorage therein.

Preferably, the perforations 20 in the roller 14 which hold the bristles are at an angle to the radius of the roller 14 to project the free ends and the burrs 23 of the successive groups of wire bristles at a substantially uniform predetermined angle into the body of the fabric 12 at the stage of initial contact therewith and to cause the free ends and the burrs 23 of the bristles to penetrate to the desired and substantially uniform extent within the body of the fabric, as is set forth more fully hereinafter.

The bristles are firmly set in the hub and preferably at an angle to the radius, so that the bristles point in the general direction of the approaching cloth in my type of stationary machine or in the general direction of the push against the cloth in my manual machine, so that the contact of each bristle with the cloth has a spear-like effect and the tension or stress is more along the length of the bristle than it would be if set in the usual manner in the hub, viz: parallel to the radius of the hub, and whereby there is less tendency for the bristles to bend backward and thus decrease the efficiency.

To maintain the burrs 23 at the free ends of the bristles, I provide the abrasive 24 of suitable material and preferably in the form of a block or bar, which is positioned in suitable relation to the free ends and the burrs 23 of the bristles to maintain uniform burrs thereon. Such block or bar 24 of abrasive is suitably supported in the casing 10 in the desired relation to the ends and the burrs 23 of the bristles, as by mounting the block or bar 24 in the metal frame 25 carried relative to the frame 10 by means of the pins 26, 27 secured respectively at their inner ends to the frame 25 and freely project through suitable openings 28, 29 in the casing 10. The outer ends of the pins 26, 27 are respectively provided with the heads 30, 31. About on each of the pins 26, 27 is coiled an expansive spring 32 one end of which rests upon the casing 10 and the opposite end abuts against the heads 30, 31 of the respective pins 26, 27. Between the openings 28, 29 I locate the adjusting screw 33 passing through a suitably threaded opening 34 in the casing 10 and provided with the knurled head 35 whereby upon tightening the adjusting screw 33, of the frame 25, the abrasive block 24 is set to contact with the free ends of the burrs 23 of the bristles at a regulatable pressure. In such setting, the pins 26, 27 of the frame 25 guide and retain the frame 25 and tension the springs 32, 32. Upon loosening the adjusting screw 33, the springs 32, 32 retract the block 24 of abrasive from contact with the free ends and the burrs 23 of the cylinder.

The other bristle rectifying means is shown in the form of the bar 36 adjustably supported relative to the casing 10 similar to the frame 25 of the abrasive block 24 and to contact with the free ends and the burrs 23 of the bristles. To such bar 36 are secured guide and retaining pins similar to the aforesaid pins 26, 27 and passing through suitable openings in the casing 10, about which pins are the coiled expensive springs 37 acting against the heads of such pins and tending to move the bar 36 radially relatively to the roller 14. The adjusting screw 38 passing through a suitably threaded opening 39 in the casing 10 serves to set

the position of the bar 36 relative to the free ends and the burrs 23 of the bristles to attain the desired pressure against the same.

Upon pushing the machine by means of the handle 11 in the direction of the arrow 13, see Fig. 1, the roller 14 is turned in the direction of the arrow 40 by reason of the contact of the wire bristles with the cloth 12.

Preferably, the wire for the bristles is crinkled, thereby producing a tendency to hold the burrs on the ends of the bristles somewhat apart, and preventing the bristles from becoming matted together; the crinkling also enhances the resiliency of the bristles.

It will be observed that the application of the abrasive 24 and the bar 36 to the ends of the bristles is effected at a stage between one stage of the formation of the nap by any particular group of burrs 23 on the face of the fabric 12 and the succeeding stage of nap formation by such particular group of burrs 23. Such action ensues continuously for the successive groups of burrs of the bristles about the periphery of the cylinder. In the event that any burr becomes dull or is worn off or is detached in the napping operation or otherwise, the abrasive 24 and bar 36 restore the burr at the end of the bristle before it is again brought in contact with the fabric. Should the angle of any burr relative to its bristle become more obtuse or otherwise altered in the napping operation or otherwise, the angle of the burr is restored to the desired uniform angle by the abrasive 24 and the bar 36 before it is brought again into contact with the fabric. In the event that any bristle is bent or twisted or otherwise distorted, the engagement by the abrasive 24 and the bar 36 with the free ends of the bristle returns it to its proper shape and position in uniformity with the remaining bristles before it is again brought in contact with the fabric thereby correcting these faults in their incipiency, before they have become pronounced. The abrasion carrying member and the bar 36 may be used intermittently if desired, by moving either out of contact with the free ends of the bristles while retaining the other in contact with the free ends of the bristles.

By reason of the engagement of the bar 24 with the free ends of the wire bristles of my napping cylinder, the degree of retardation or "drag" on the bristles is regulated by the adjusting screw 33 of the bar 24. It will be observed that at each instant, that is to say, for the successive stages of the rotation of the wire bristles as a whole relative to the bar 24, the regulated pressure is applied to the bristles for the full width of the napping cylinder which at such instant are in contact with the bar 24, and that such pressure is transmitted through the resilient body portions of such bristles 21, thence through the roller 14 of the napping cylinder and thence through the resilient body portions of the bristles 21 which at that instant are in engagement with the fabric 12. Such resilient means of transmission of the retardation or "braking" effected by the bar 24 on the bristles in producing the desired "drag" on the napping cylinder is enhanced by the provision of the bristles extending at an angle to the radius of the roller 14, as is set forth more fully herein as another feature of my invention.

A similar regulation of the pressure of retardation or drag on my napping cylinder is had by the bar 36, the other of my bristle rectifying means, which bar 36 is regulated by means of its regulating screw 38 and which bar 36 may be set in operation simultaneously with the bar 24 or intermittently as is set forth more fully herein.

In the napping or re-napping operation effected by the successive bristles, the fabric tends to displace the bristles and such displacement is compensated or equalized by the engagement of my bristle rectifying means, to wit, the abrasive 24 or the bar 36 with such displaced bristle or bristles, which engagement ensues substantially immediately after such displacement, in which operation of compensation or equalization, the engagement of such displaced bristle or bristles with my bristle rectifying means is opposite in direction to the force applied by the fabric on the bristle in causing such displacement; accordingly, the operation of the bar 24, and similarly of the bar 36, in such compensating or rectifying action is substantially equal in the extent of force and substantially opposite in direction, thus completely carrying out the rectification action.

Since in the practical use of napping devices of this character in the art, all of above faults in the burrs and needles occur continuously and increasingly during its use, and since upon the maintenance of the uniformity of the sharpness of the burr, the angle of the burr to the bristles and the angle of the bristles to the hub, depends the uniformity of the nap, the importance of these corrective methods applied the instant after any fault arises, is apparent. Accordingly, by my method as carried out by my machine the free ends of the burrs 23 of the successive groups of the bristles are presented to and penetrate easily within the body of the fabric and at the desired uniform pressure and with the desired substantially uniform depth of penetration.

By reason of the inclination of the fixed ends of the tufts of the bristles at an angle to the radial direction of their supporting roller and the positioning of the face of the abrasive substantially tangential to the roller, the angle of each burr to its bristle is obtuse, that is to say, less than an one hun-

dred and eighty arcuate degree angle and greater than a 90 arcuate degree angle. In carrying out my invention, as above described, each group of bristles is brought upon the rotation of the cylinder to approach and penetrate the woven body $12^a$ of the fabric, the penetration attaining at a certain stage a predetermined maximum and uniform extent, and upon the continued rotation of the cylinder the bristles in the successive groups are retracted from the body $12^a$ of the fabric and present their burrs 23 at a substantially uniform angle to the warp and weft threads constituting the woven structure of the body $12^a$ of the fabric and on leaving the fabric exert a uniform pull at a substantially uniform angle and thereby form the nap $12^b$ of the desired uniform density and height above the face of the woven structure of the fabric. It will be observed that the path of withdrawal of the burrs 23 from the body of the fabric effects the positioning of the burrs 23 at an angle to readily release their hold on the raised or napped portions of the fabric without cutting or unduly pulling the same.

My invention as applied to the form of my machine having its axis of rotation substantially fixed and the fabric drawn under power in proper relation to the napping cylinder, effects a similar napping action.

In Fig. 5 is illustrated one type of machine employing this form of my device. The napping cylinder 41 is of the construction as aforesaid and like parts of the cylinder are designated by the same reference numbers.

Referring to Figs. 5 and 6, the fabric 42 is drawn by any suitable means in the direction of the arrow 43, thus causing the napping cylinder 41 to be rotated in the direction of the arrow 44. In the particular form of my device as illustrated in Figs. 5 and 6, the cloth 42 is engaged by the bristles and burrs of the napping cylinder 41 as it passes over the periphery of the roll 43. The cylindrical surface of the roll 43 accordingly may be machined within close accuracy to thereby present the outer face of the fabric 42 evenly to the bristles and the burrs of the napping cylinder 41. It will be understood that any other suitable support for the cloth 42 and any other desired location of its travel may be selected for properly presenting the cloth to the napping cylinder.

The journal bearing 49 within the extension 50 of the frame 46 for the napping cylinder 41 may also be adjustable and set by adjusting bolts 51, 52 to afford accurate setting of the napping cylinder 41 relative to the cloth 42 on the periphery of its supporting roll 43.

The frame 46 for the support and propulsion of the cloth 42 may comprise in addition to the roll 43, another roll located on the frame 46 opposite to the roll 43 and an additional roll serving as a tensioning roll to effect a tension sufficient to cause the travel of the cloth 42 by the driving roll and for regulating the tension exerted on the cloth 42. Such additional roll may serve as the driving roll. Where it is desired to reduce the drag of the napping cylinder on the cloth to be napped or re-napped, the napping cylinder may be of a length less than the width of the cloth and the napping carried out in successive stages. Thus, see Fig. 7, the cloth is indicated at 53 and the napping cylinder at 54, the length of the napping cylinder is indicated as approximately one-fourth of the width of the cloth 53. In the position of the napping cylinder 54 as indicated in Fig. 7, the napping operation is being carried out in the second stage, the previous stage of napping, namely adjacent the edge 55 of the cloth 53, is indicated at 56 and of a width corresponding to the width of the napping cylinder 54. By such procedure, the drag on the cloth 53 is reduced to one-fourth of the drag if the napping cylinder 54 extended fully over the width of the fabric 53. The number of such stages of the napping operation may be selected as desired.

For securing rigidity of the support of the napping cylinder 54, I construct the mounting to preclude sagging of the support to effect uniform engagement between the napping cylinder 54 and the fabric 53 for all positions of the napping cylinder 54 in its support. Such support may be in the form of the parallel rods 57, 58 of relatively large cross sectional area. The napping cylinder 54 is slidably mounted on the supporting rods 57, 58 as by means of the oppositely disposed arms 59, 60, having bearing openings 61 for receiving the opposite ends of the shaft 15 of the napping cylinder 54. The arms 59, 60 are provided with the openings 62, 63 for respectively slidingly receiving the rods 57, 58. The arms 59, 60 are clamped in any desired position by means of the set-screws 64.

Preferably, the supporting rods 57, 58 are of angular cross-section such as square or trapezoidal or hexagonal or the like, and the openings 62, 63 in the arms 59, 60 are of similar cross-section with but the minimum clearance for the sliding movement to enhance the rigidity of the axis of the roller of the napping cylinder by the engagement between the faces of the openings 62, 63 and the faces of the bars 57, 58.

As indicated above, the application of the abrasive 24 may be carried out continuously or intermittently. Where it is desirable to carry out the abrasive applying stage intermittently as in the form of my invention shown in Figs. 5 and 6, the abrasive is brought in contact with the ends of the

bristles and the burrs 23 thereon by tightening its adjusting screw 35, similarly as in Figs. 1 and 2.

In my napping machine having its napping cylinder rotatably mounted on a stationary support to which the fabric is fed, the napping cylinder may be of any length to meet the requirements and the abrasive carrying member may be the full length of the cylinder and adjustable in its relation to the ends of the bristles; as also may be the bar 36 for smoothing the ends of the burrs and assisting in rectifying the faults of the bristles and burrs. The application of the abrasive and bar 36 to the full length of the cylinder at the same moment with equal pressure, secures substantially perfect alignment of the burrs, which is most essential for good work. The application of the abrasive and the bar 36 may be continuously or intermittently and may be used together or separately.

In Fig. 7, the direction of the travel of the cloth 53 is indicated by the arrow 43 and the direction of travel of the napping cylinder 54 is indicated by the arrow 44, similarly as in corresponding parts in Fig. 5. The application of the abrasive 24 to the ends and burrs of the bristles of the napping cylinder 54 may be continuous as in the arrangement of Fig. 5 or intermittent, and similarly the application of the bar 36 serving to rectify the bristles and the burrs; if desired, the application of the abrasive 24 and the bar 36 may be carried out alternately.

Whereas, I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:—

1. The combination of a housing with means for manual propulsion, a roller rotatably mounted in the housing, a plurality of napping members of suitable material mounted in the roller and means for re-sharpening and for applying a drag to said napping members, said re-sharpening and said drag applying means being supported in the housing so as to be in contact with all of the napping members during each revolution of the roller.

2. The combination of a housing with means for manual propulsion, a roller rotatably mounted in the housing, a plurality of napping members of suitable material mounted in the roller, said napping members having their free ends burred and means for re-sharpening and for applying a drag to said burrs, said re-sharpening and said drag applying means being supported in the housing so as to be in contact with all of the burrs during each revolution of the roller.

3. The combination of a housing with means for manual propulsion, a roller rotatably mounted in the housing, a plurality of napping members of suitable material mounted in the roller, said napping members extending at such an angle to the radius of the roller as to enter the material to be napped in a spear-like manner when roller is rolled over it and means for re-sharpening and for applying a drag to the said napping members, said re-sharpening and said drag applying means being supported in the housing so as to be in contact with all of the napping members during each revolution of the roller.

4. The combination of a housing with means for manual propulsion, a roller rotatably supported in the housing, a plurality of napping members of suitable material mounted in the roller with their free ends burred, said napping members extending at such an angle to the radius of the roller as to enter the material to be napped in a spear-like manner when roller is rolled over it and means serving jointly for applying a drag to said napping members and for restoring the angular relation of any of said napping members deranged relative to said roller said angle restoring means being supported in said housing.

5. The combination of a roller having wire bristles mounted thereon in predetermined angular relation relative to the roller, means for rotatably supporting said roller, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any bristle deranged relative to said roller and means for supporting said drag applying and bristle angle restoring means on said roller mounting means.

6. The combination of a roller having wire bristles mounted thereon in predetermined angular relation relative to the roller, means for rotatably supporting said roller, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any bristle deranged relative to said roller and means for supporting said drag applying and bristle angle restoring means on said roller mounting means at a location to effect contact with the successive series of said bristles between their respective successive stages of napping.

7. The combination of a roller having wire bristles mounted thereon in predetermined angular relation relative to the roller, means for rotatably supporting said roller, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any bristle deranged relative to said roller and means for supporting said drag applying and bristle angle restoring means on said roller mount-

ing means at a location to effect substantially uniform contact with the successive series of said bristles between their respective successive stages of napping.

8. The combination of a roller having wire bristles mounted thereon in predetermined angular relation relative to the roller, means for rotatably supporting said roller, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any bristle deranged relative to said roller and adjustable means for supporting said drag applying and bristle angle restoring means on said roller mounting means at a location to effect substantially uniform contact with the successive series of said bristles between their respective successive stages of napping.

9. The combination of a roller having wire bristles mounted thereon in predetermined angular relation relative to the roller, means for rotatably mounting said roller, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any bristle deranged relative to said roller, said drag applying and bristle angle restoring means extending the full effective length of said roller and means for supporting said drag applying and bristle angle restoring means on said roller mounting means.

10. The combination of a roller provided with recesses disposed at a predetermined angle to the radius of the roller, tufts of wire bristles having their inner ends fixedly mounted in said recesses, burrs disposed at the outer ends of said bristles, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any bristle deranged relative to said roller and means for rotatably supporting said roller.

11. The combination of a roller provided with recesses disposed at a predetermined angle to the radius of the roller, tufts of wire bristles having their inner ends fixedly mounted in said recesses, burrs disposed at the outer ends of said bristles, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any bristle deranged relative to said roller, means for rotatably supporting said roller and means for mounting said drag applying and angle restoring means on said roller mounting means at a location to effect contact with the successive series of said bristles between their respective successive stages of napping.

12. The combination of a roller provided with recesses disposed at a predetermined angle to the radius of the roller, tufts of wire bristles having their inner ends fixedly mounted in said recesses, burrs disposed at the outer ends of said bristles, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any burr deranged relative to its bristle, means for rotatably supporting said roller and means for mounting said drag applying and predetermined angle restoring means on said roller mounting means at a location to effect contact with the successive series of said bristles between their respective successive stages of napping.

13. The combination of a roller having crinkled wire bristles mounted thereon in predetermined angular relation relative to the roller, means for rotatably supporting said roller, means serving jointly for applying a drag to said wire bristles and for restoring the predetermined angular relation of any deranged bristles relative to said roller and means for supporting said drag applying and bristle angle restoring means on said roller mounting means at a location to effect contact with the successive series of said burrs between their respective successive stages of napping.

In testimony whereof I have signed this specification this 29th day of May 1925.

MORTIMER F. FLYNN.