Nov. 29, 1955 G. R. CHURCHILL 2,724,937

BUFFING WHEEL

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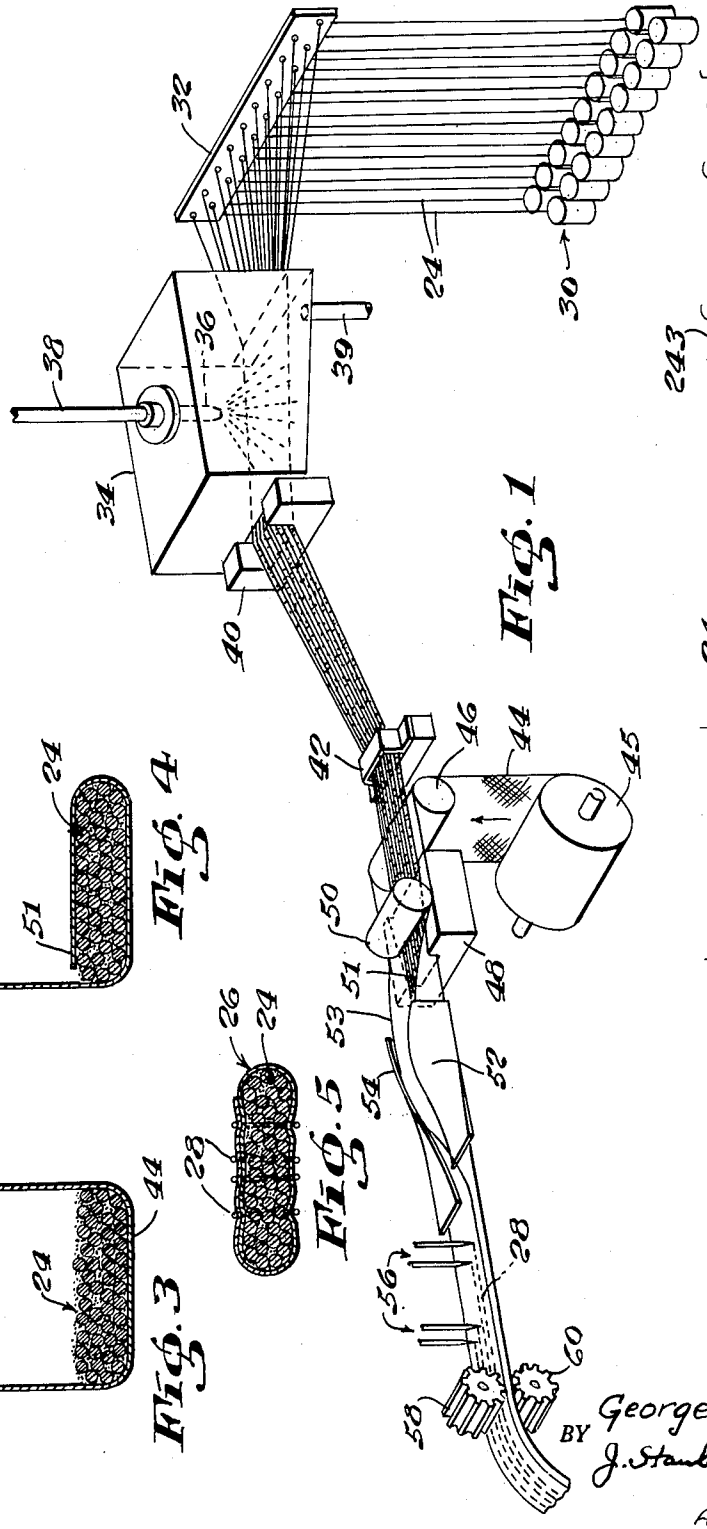


Fig. 1

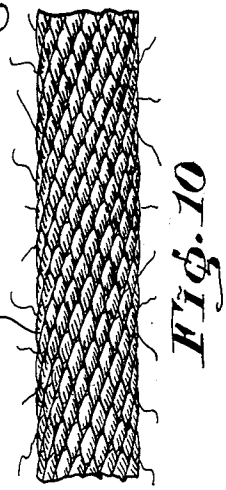


Fig. 10

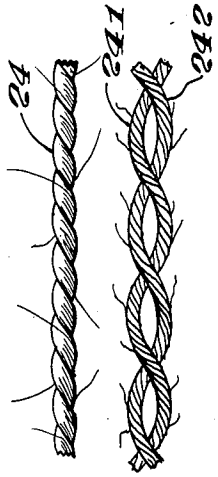


Fig. 2

Fig. 2a

Fig. 4

Fig. 3

Fig. 5

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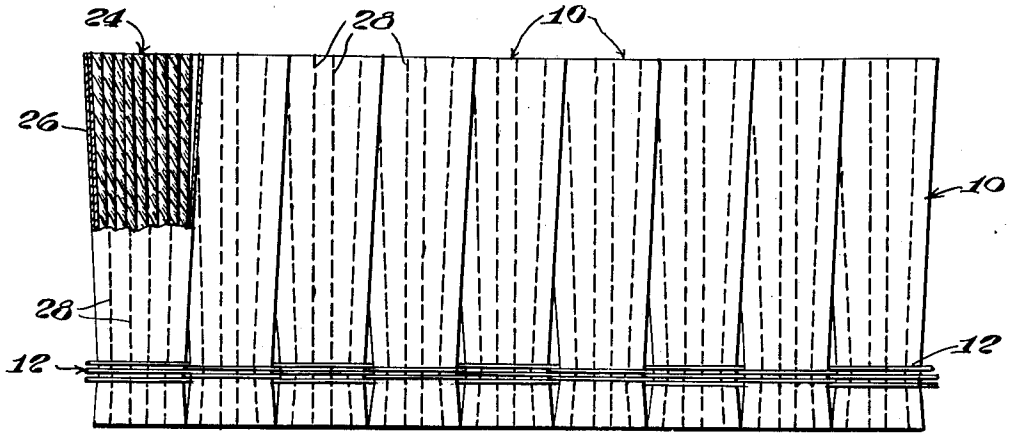


Fig. 6

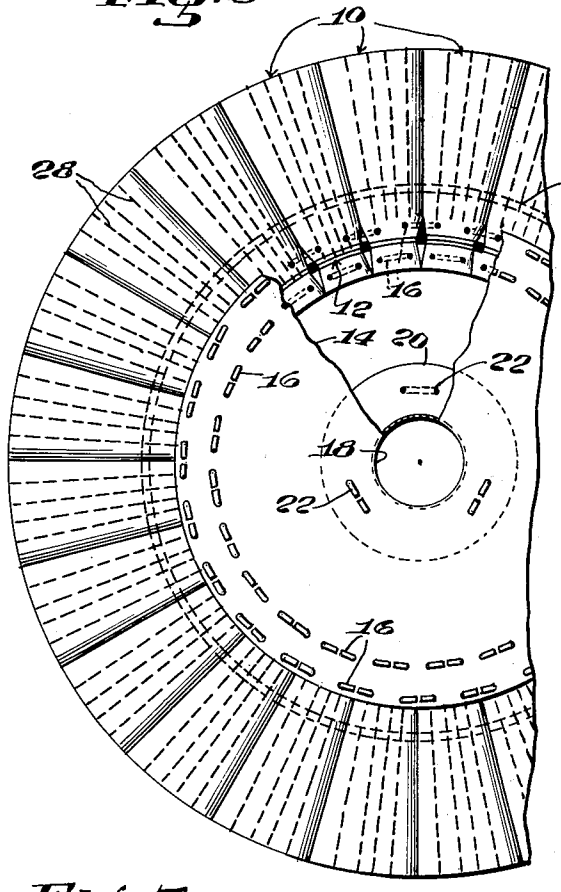


Fig. 7

Fig. 8

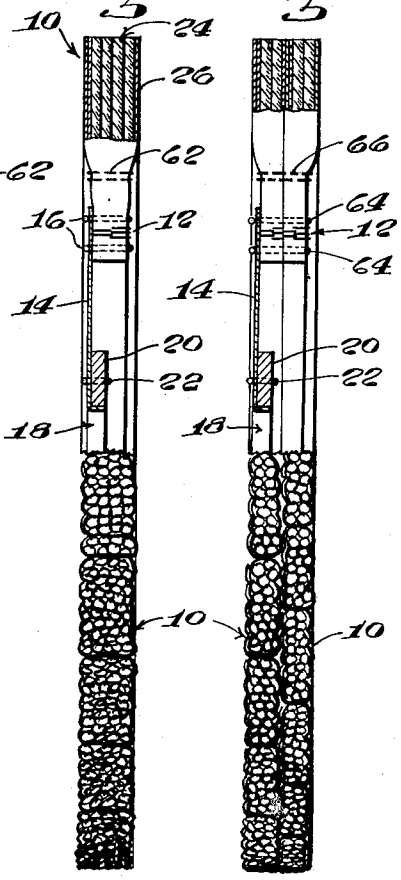


Fig. 9

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BUFFING WHEEL

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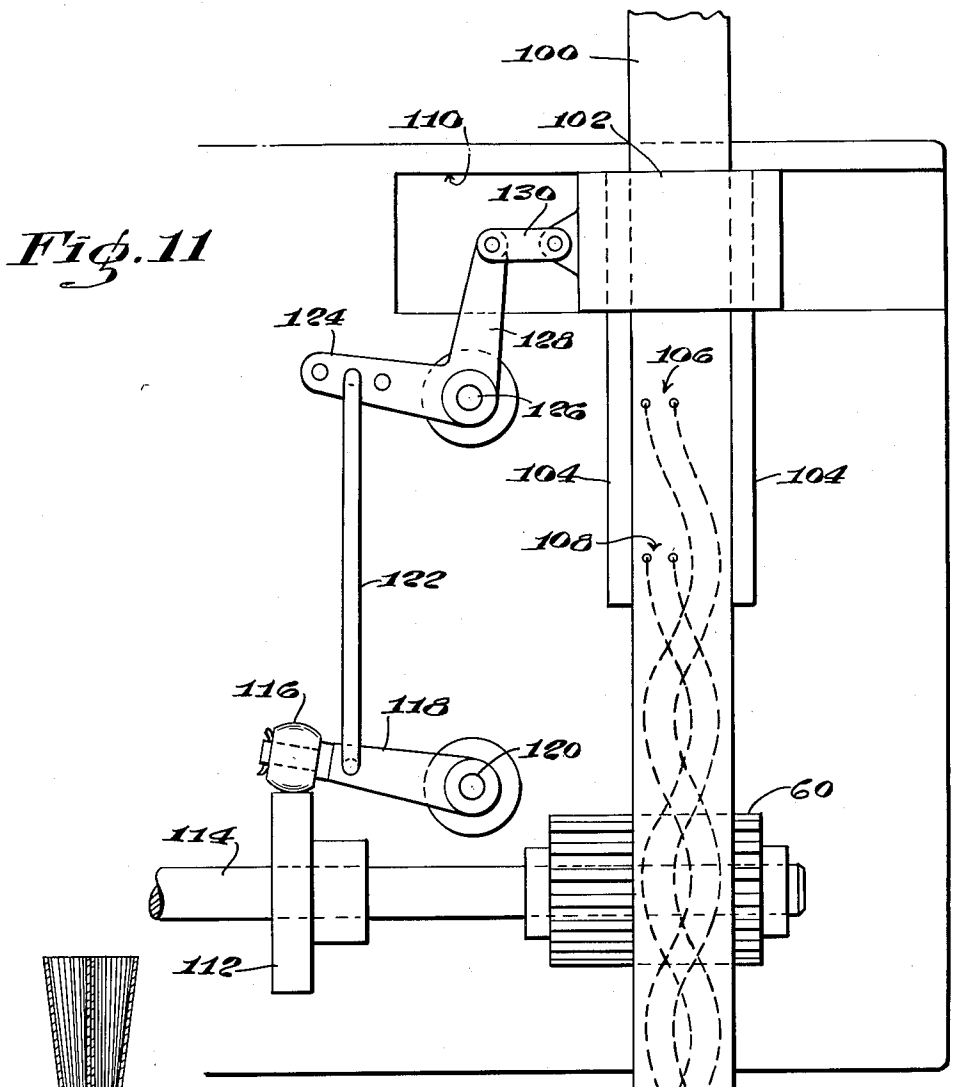


Fig. 11



Fig. 12

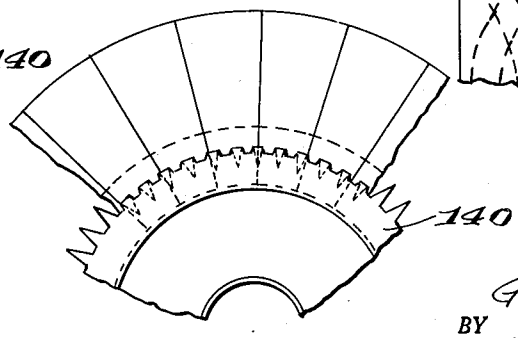


Fig. 13

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BUFFING WHEEL

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Application March 3, 1953, Serial No. 340,054

4 Claims. (Cl. 51—193)

This invention relates to a buffing wheel.

In general, the object of the invention is to provide a novel construction of buffing wheel which is particularly adapted to be used with advantage in producing a superior buffed finish upon certain types of metal and metallic surfaces.

Another object of the invention is to provide a novel construction of buffing wheel embodying novel buffing elements and which may be economically manufactured and used with advantage for a wide variety of buffing purposes.

A still further object of the invention is to provide a novel and practical method by which the present buffing wheels may be economically manufactured from individual strands of twisted fibers and particularly of twisted sisal fibers, each of relatively small sectional dimension.

With these general objects in view and such others as may hereinafter appear, the invention consists in the buffing wheels and in the method of making the same hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention:

Fig. 1 is a perspective view diagrammatically illustrating apparatus for making the buffing elements which may be used in producing the present buffing wheel;

Fig. 2 is a detail view of a strand of twisted fiber, so-called "laid" sisal, preferably employed in making the buffing element used in producing the present buffing wheel;

Fig. 2*a* is a similar view showing the preferred strand partially untwisted to reveal two component strands thereof;

Figs. 3, 4 and 5 are cross-sectional views of the one form of buffing element embodying the invention illustrating successive steps in folding an outer wrapper about the fibrous strands and stitching the same;

Figs. 6 and 7 are side elevations respectively of a length of connected buffing elements and of a buffing wheel embodying such buffing elements, portion of Fig. 7 being broken away;

Fig. 8 is an edge view, partly in cross section, of a buffing wheel having a single row of buffing elements produced in accordance with the present invention;

Fig. 9 is a similar view of a modified form of buffing wheel embodying two rows of buffing elements to form a duplex buffing wheel;

Fig. 10 illustrates the rope form of bundle assembly of the plurality of twisted fibrous strands, preferably of so-called "laid" construction, which may be used in producing the present buffing elements;

Fig. 11 is a plan view, illustrating more or less diagrammatically, sewing mechanism for producing a modified pattern of stitching in the strip from which the present buffing elements may be formed, as will be described;

Fig. 12 is a section of a portion of a modified buffing wheel wherein the present buffing elements are disposed in U shape and are secured to a hub member; and

Fig. 13 is a plan view of a portion of the wheel shown in Fig. 12.

In general, the invention contemplates a novel and improved buffing wheel embodying a plurality of radially extended buffing elements. Preferably, the buffing element comprises a bundle of or a relatively large number of strands of twisted fibrous material, such as sisal, each strand being of small sectional dimension. The individual twisted strands may and preferably will comprise a small number of component strands of the twisted fibrous material, and the component strands are twisted to form a strand of the general type heretofore used in the production of stout or relatively heavy sisal twine, and which comprises a construction known in the art as a "laid" construction. Briefly, as is well known in the rope-making art, in producing a "laid" construction from two or more strands of twisted fibers, the original twist in each strand is maintained and controlled so as to remain substantially constant during the operation of laying the component strands around one another in producing the twine or product illustrated in Fig. 2. Such a "laid" structure is characterized particularly by the absence of any tendency to untwist, and when attempt is made to untwist the "laid" twine and the same is released, the twine resumes its "laid" condition illustrated in Fig. 2. Experience has shown that the "laid" twine or composite strand of component strands of twisted fibers improves the operation of the present buffing wheel particularly as to durability and efficiency.

In the manufacture of the individual buffing elements a plurality of twisted fibrous strands, and preferably "laid" sisal strands, may be assembled into bundle formation, or the individual strands may be assembled in a slightly twisted formation in the form of a rope, as shown in Fig. 10. Preferably, the bundle assembly with the individual strands of "laid" or twisted sisal or other "laid" or twisted fibrous material, either assembled in untwisted relation, or the rope assembly with the twisted strands assembled in slightly twisted relation, may be enclosed within a wrapping of a fibrous sheet, preferably cloth, and the latter stitched or otherwise secured to form a unitary wrapped assembly. For some purposes a special wrapping of cloth, paper or other sheet may be adhesively secured to and enclose the bundle assembly. The buffing wheel may be formed by a substantial number of buffing elements secured to a hub member and extending therefrom in radial relation and preferably with the adjacent radial buffing elements in closely disposed relation. Conveniently, the inner ends may be stapled or otherwise secured to a hub provided with an arbor hole for enabling a series of the individual buffing wheels to be assembled on the arbor to form a roll or workable face.

Referring now to the drawings, as illustrated in Fig. 7 the buffing wheel in its preferred form may comprise a plurality of radially extended buffing elements, indicated generally at **10**, connected together at their inner ends, preferably by weaving wires **12** extending around adjacent buffing elements and attached to a hub member for assembly on an arbor or shaft. The hub member may take various forms and preferably comprises a metal or cardboard supporting disk **14** to which the individual buffing elements are secured by staples **16** to extend radially therefrom as illustrated. The disk **14** is provided with a central opening **18** to fit over the rotary arbor, and when composed of relatively thin sheet metal the disk **14** may be provided with a relatively small reinforcing disk **20** secured thereto about the opening **18** by staples **22**, as shown. A buffing wheel thus produced forms an individual buffing-wheel section, a plurality of which may

be mounted side by side on an arbor and clamped together to form a relatively wide buffing wheel or roll.

In accordance with the present invention, each buffing-wheel element **10** comprises an assembly or bundle of a relatively large number of strands, each of twisted fibrous material, and with each strand of relatively small sectional dimension. The individual twisted strands may and preferably will comprise a small number of component strands of the twisted fibrous material, and the component strands are preferably "laid" to form a strand of the general type heretofore used in the production of stout or relatively heavy sisal twine.

In the preferred form of the invention, the assembly or bundle **24** of the twisted or "laid" fibrous strands making up the individual buffing elements **10** may be enclosed within an outer wrapper or sheath **26** which may comprise cloth sheeting or other fibrous sheet material as above set forth. Each buffing element thus formed may be stitched longitudinally, preferably by a plurality of parallel rows of stitching, indicated at **28**, to secure the wrapper about the core and forming a relatively flat, elongated buffing element possessing considerable rigidity and with strands making up the core of the buffing element extended longitudinally thereof. As indicated in Fig. 5, the spaced rows of stitches may pass through both sides of the wrapper and the intervening strands of twine and form in effect retaining compartments maintaining the strands in relatively tightly bundled relation in their separate compartments.

In practice, the buffing elements **10** may and preferably will be produced by first forming an extended length or strip comprising the bundled strands and preferably the wrapper and by then cutting the same into uniform lengths which may then be connected together at one end in units of one or more bundles by the weaving wires **12** to form a connected length thereof, as shown in Fig. 6. The weaving wires serve to hold the strands in bundled relation and to compress the connected ends of each buffing element and to thus cause the remaining length of each element to flare out to the full width at the free ends thereof. In practice, the extended portions of the elements may overlap somewhat along their longitudinal edges, as illustrated.

In forming a buffing-wheel section, a desired length of connected buffing elements of the form shown in Fig. 6 may be formed into a closed ring of radially extended elements, the ends of the length being connected by twisting or otherwise securing the ends of the weaving wires together. Thereafter, the closed ring may be secured to a hub member and as herein shown arranged concentrically with respect to the supporting disk **14** and attached thereto by the staples **16**. As illustrated in Fig. 7, two concentric rows of staples may be provided, one row within and one row without the circle formed by the weaving wires. The staples are preferably extended through the buffing elements and into the supporting disk **14**, the ends of the staples being clinched over the disk as shown, and in practice, the staples in the two rows may be arranged in staggered relation, preferably with the staples in one row secured with both legs thereof extended through an individual buffing element, and with the staples in the other row secured with their legs extended through and connecting adjacent buffing elements. The staggered relationship of the two rows of staples is preferably such that the ends of the staples in one row slightly overlap the ends of the staples in the other row so that all of the underlying strands of twine forming the core of each element are firmly embraced between the legs of at least one staple and secured to the supporting disk, and some of the strands are embraced between the legs of two staples at the points where the staggered staples overlap at their ends whereby to assist in retention of the strands in assembled relation with the supporting disk during the operation of the buffing wheel.

One form of apparatus which may be used for producing an extended length or strip of the wrapped and bundled assembly of the twisted or "laid" fibrous strands, such as the sisal twine, is diagrammatically illustrated in Fig. 1, wherein a plurality of twisted or "laid" fibrous strands, and preferably the "laid" or twisted sisal strands **24** are withdrawn from a supply thereof, as indicated at **30**, and threaded through individual spaced openings in a guide plate **32**. The individual strands may then be passed through a spray box **34** to be subjected to a spray of the saturating preparation which may be forced under pressure through a nozzle **36** connected by a flexible hose **38** to a supply thereof, the surplus being returned to the supply through a drain pipe **39** to be recirculated. As illustrated, the strands enter the rear of the box through a relatively wide opening permitting the strands to maintain their spaced relation during the saturating operation. The strands then pass through a relatively smaller opening in the front of the box and over a U-shaped guide member **40** to bunch the strands together. The treated strands then pass through a second guide **42** after which they are arranged to be combined with a web of cloth **44** to provide a sheath or covering for the twisted or "laid" fiber-core assembly. The cloth preferably previously cut on the bias as indicated may be withdrawn from a supply roll **45** and guided over an idler roll **46** where it is combined with the fiber. The cloth web together with the bundle-strand assembly then pass over a grooved guide member **48** and under a weighted roller **50** arranged to press and flatten the bunch down into the web and into the groove formed in the guide, the groove preferably being tapered and deepened toward its forward end. The marginal edges **51, 53** of the web are then folded over the top of the core assembly in overlapping relation by suitable curved guide rails **52, 54** during the continuous advance of the material therethrough in the manner illustrated in Fig. 1. The composite strip thus formed is then guided through a sewing machine diagrammatically illustrated by the needles **56** to form a plurality of rows of stitches **28** longitudinally of the strip, the strip being advanced by a pair of continuously rotated grooved feed rolls **58, 60** as it passes through the sewing machine. The elongated strip of buffing material may then be fed to a weaving machine of known construction, not shown, which operates to sever from the elongated strip successive buffing elements **10** of substantially equal lengths and to connect one or more of the elements together at one end by the wires **12**. In the weaving operation, successive sheds are formed on the weaving wires, into each of which the ends of one or more buffing elements **10** are inserted and compressed into compact form and firmly held by the wires to form a length of buffing elements of the form shown in Fig. 6 and as described.

The sisal twine preferably employed in the production of the illustrated buffing elements may and preferably will be of a relatively tightly twisted and "laid" structure and preferably of the type formed from at least two "laid" strands of twine **241, 242**, see Fig. 2. This structure enables a relatively tight twist to be made and maintained in the twine, as shown in Fig. 2, whereby a durable and highly efficient buffing element may be produced.

Instead of the above-described mechanism for collecting and bundling a plurality of the twisted or "laid" strands from a plurality of rolls thereof, a prepared length of bundled twisted or "laid" strands may be used. Preferably, the requisite number of individual "laid" twisted strands of the type shown in Fig. 2 may be processed into general rope form as shown at **243** in Fig. 10, wherein the different strands are slightly twisted, as for example a twist of about 180° in a length of six inches, so as to impart a rope formation to the assembly. The amount of twist may be varied to produce different buffing effects, and in practice, such a rope may be withdrawn from a reel, not shown, and fed directly through the guide **42** and into the strip-forming mechanism to be provided with

the fibrous or cloth covering and stitched longitudinally or cemented, as above described, or otherwise secured to the core.

The slight twist in the rope-like assembly enables straight rows of stitching to pass through all of the strands instead of between them, contributing to the strength of the buffing element produced.

In a modified form of the invention, the strip of wrapped buff-forming material may be provided with two double rows of wavy lines of stitching extending longitudinally and from side to side of the strip, one double row of stitching periodically intersecting the other double row of stitching, as illustrated in Fig. 11. This may be accomplished by reciprocating the strip laterally relative to spaced pairs of stitching needles during the continuous advance of the strip through the sewing mechanism. As shown in Fig. 11, the strip of buff-forming material **100** may be fed through a guide member **102** having elongated extensions **104**, then into operative relation to the spaced pairs of stitching needles **106**, **108**, and then between the continuously rotated feed rolls **58**, **60**, the lower roll **60** only being shown in Fig. 11. The guide member **102** is mounted for lateral reciprocation in a groove **110** formed in the platen of the sewing machine and is arranged to be reciprocated by a cam **112** fast on the feed-roll shaft **114** and through connections including a cam roll **116** carried by an arm **118** pivotally mounted at **120**. The arm **118** is connected by a link **122** to one arm **124** of a bell crank pivotally mounted at **126**, the second arm **128** of the bell crank being connected by a link **130** to the guide member **102**. With this construction it will be seen that as the strip is reciprocated laterally relative to the spaced pairs of stitching needles during the continuous advance of the strip, wavy lines of stitching are formed, the spaced relationship of the two pairs of stitching needles effecting a crisscross pattern as shown.

In order to additionally reinforce and bind together the assembled buffing-wheel section, a double row of circular stitching **62** may be provided, the stitching **62** being concentric with and spaced a short distance from the periphery of the circular supporting disk **14**, as illustrated.

In the illustrated embodiment of the invention, the buffing-wheel sections may be made in single or multiple-form types, Fig. 8 illustrating a single-section type, and Fig. 9 illustrating a double-section type. In practice, the single-section type may be produced to provide a greater number of sisal strands in each buffing element than the buffing elements of the double type. For example, the single type may have approximately 30 to 40 or more strands of sisal twine in each buffing element, whereas the double type may have approximately 20 strands of twine per element.

The single type buffing-wheel section illustrated in Fig. 8 includes a single ring of buffing elements attached to the disk or hub member **14**, as described, the double type section comprising two separate rings placed side by side and stapled together and to the disk **14** by relatively long staples **64**, the construction of the double type wheel being otherwise the same as the single type. The separate rings of the double type buffing-wheel section may and preferably will be assembled side by side with the free ends of the buffing elements of one ring in staggered relation to the free ends of the elements of the second ring, as illustrated in Fig. 9, and may likewise be provided with a double row of circular stitching **66** connecting the two sections together at a point a short distance beyond the periphery of the supporting disk **14**.

As illustrated in Figs. 12 and 13, the individual buffing-wheel elements may be attached to a hub member with the individual elements disposed in U form, and when so doing the strip of covered twisted or "laid" strand assembly will be severed to produce individual buffing elements of substantially double the length of the buffing elements shown in Figs. 6 and 7, and such elongated buffing elements may be assembled in a special hub member, such as is indicated in Figs. 12 and 13 at **140**, and such a hub member provided with deformable teeth arranged to be bent into the outer surfaces of the two legs of the U-shaped buffing element to secure the same to the hub.

From the description thus far, it will be observed that in the buffing wheel forming the subject of the present invention the twisted strand structure contributes to the efficiency and durability of the wheel. It will be observed from a consideration of Fig. 2 that the fibers in the individual strands are indicated as twisted so that at the wearing surface or peripheral face of the wheel the fibers extend in a non-perpendicular relation to the face, or in other words, at an angle somewhat less than a right angle with respect to the face. The effect of this angularity at which the fibers extend at the face of the wheel, as both when the wheel is moved and as it wears down, is similar in its effect to that produced in conventional prior-type buffing wheels wherein the cloth buffing elements are produced from bias-cut cloth. Experience has shown this angularity plays an important part in enabling the wheel to perform buffing operations for which prior types of buffing wheel do not appear to be suitable. The exact angularity of the fibers in the twisted strand depends on the amount of twist in the strand and may vary considerably, but as a general rule, satisfactory results have been obtained in which the fibers extend at an angle of from 45° to 60° with respect to the surface of the wheel.

The general type of "laid" twisted sisal fiber which is preferably employed in the construction of the present buffing wheel is that known in the trade as "binders' twine" and which in fact comprises a stout or heavy twine. The present buffing wheel has been found in practice to impart a superior finish to the work and for some purposes it has been found that by varying the amount of cloth, as for example the number of plies of cloth employed in the buffing element, varied effects may be obtained, such as imparting higher color to the buffed work.

While it is preferred to utilize twisted or "laid" sisal strands, it will be understood that other types of fiber may be used, such for example as jute, hemp, manila and other fibers used in the rope-making art.

Having thus described the invention, what is claimed is:

1. A buffing wheel section having radially extending buffing elements and a hub member to which the buffing elements are secured at their inner ends, said buffing elements being disconnected from one another for a major portion of their length inwardly from the periphery of the buffing wheel section, whereby to enable the buffing elements to individually flex during a buffing operation, each buffing element comprising an assembly of twisted strands of fibrous material extending longitudinally of the buffing element; and a fibrous wrapper enclosing said assembly and having longitudinal stitching extending therethrough and subdividing the assembly into separate groups of strands and compressing said groups transversely and imparting an elongated cross section to said buffing elements in a direction generally perpendicular to the axis of the buffing wheel section, the separate groups of strands cooperating with one another to impart rigidity to the individual buffing elements to resist deflection in use, and the wrapper and stitching maintaining said groups of strands in substantially the same relative relation throughout the life of the buffing elements.

2. A buffing wheel section as defined in claim 1 wherein the twisted strands of fibrous material are sisal and of a cross sectional dimension, such as that employed to produce stout sisal twine.

3. A buffing wheel section as defined in claim 1 in which the buffing elements are secured to the hub member by a plurality of rows of staples, the staples in one row extending through the individual buffing elements and the staples in the other row being staggered relative

to the first mentioned staples and extending through adjacent buffing elements, the staples in the two rows also including portions overlapping radially, whereby the strands in the buffing elements are securely fastened to the hub member by at least one staple.

4. A buffing wheel section as defined in claim 1 wherein each buffing element comprises an individual assembly of a relatively large number of cords, with each cord consisting of a few but at least two pretwisted yarns with each yarn twisted around the other yarns forming the cord, the twist of the yarns about one another being in a direction opposite to the twist in the yarns themselves whereby the opposed twists balance one another and impart resistance to any tendency of the fibers or yarns to untwist.

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