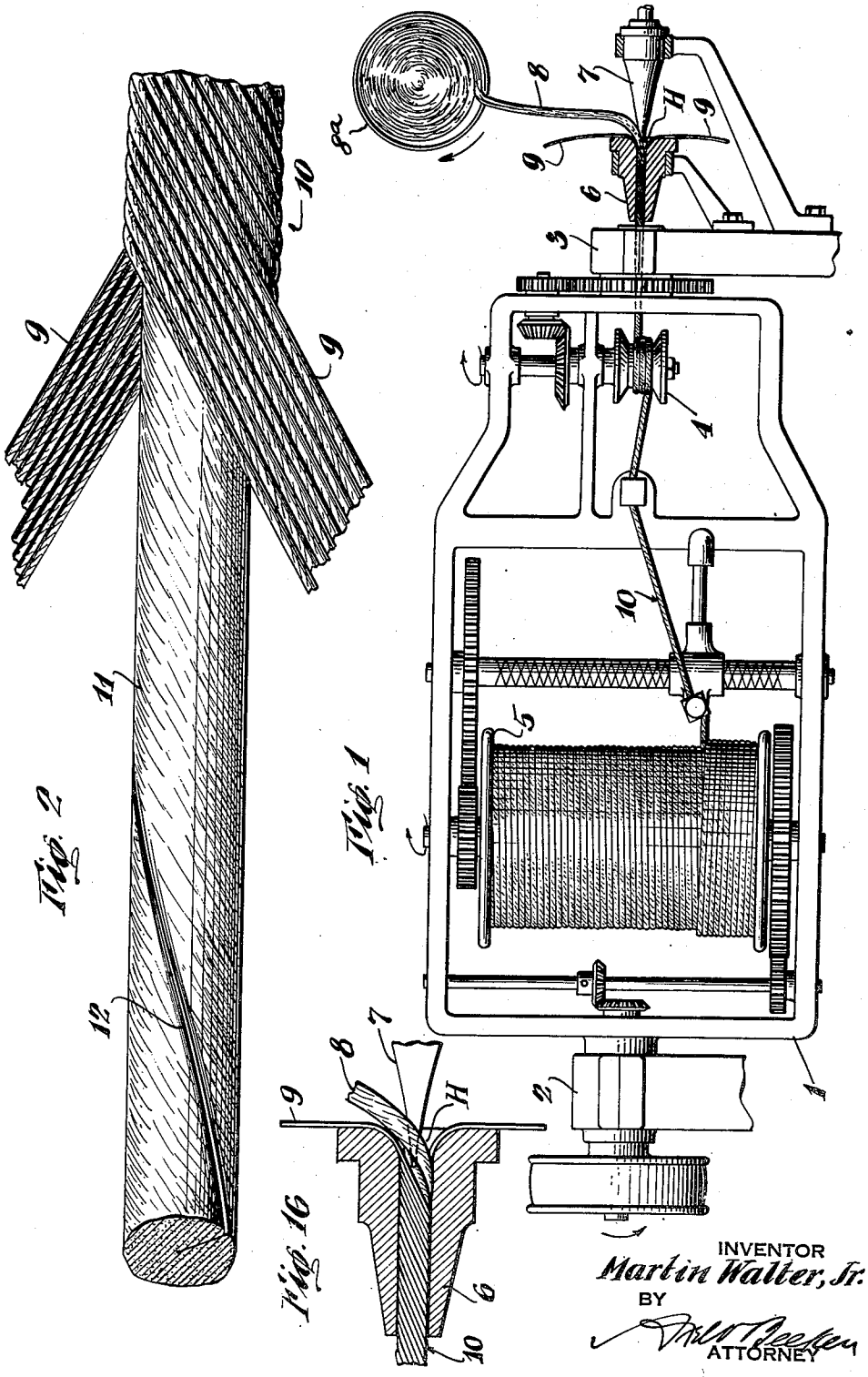
Oct. 15, 1940. M. WALTER, JR 2,218,224

ART OF ROPE MAKING

Filed Feb. 10, 1939 5 Sheets-Sheet 1



INVENTOR
Martin Walter, Jr.
BY
ATTORNEY

Oct. 15, 1940. M. WALTER, JR 2,218,224

ART OF ROPE MAKING

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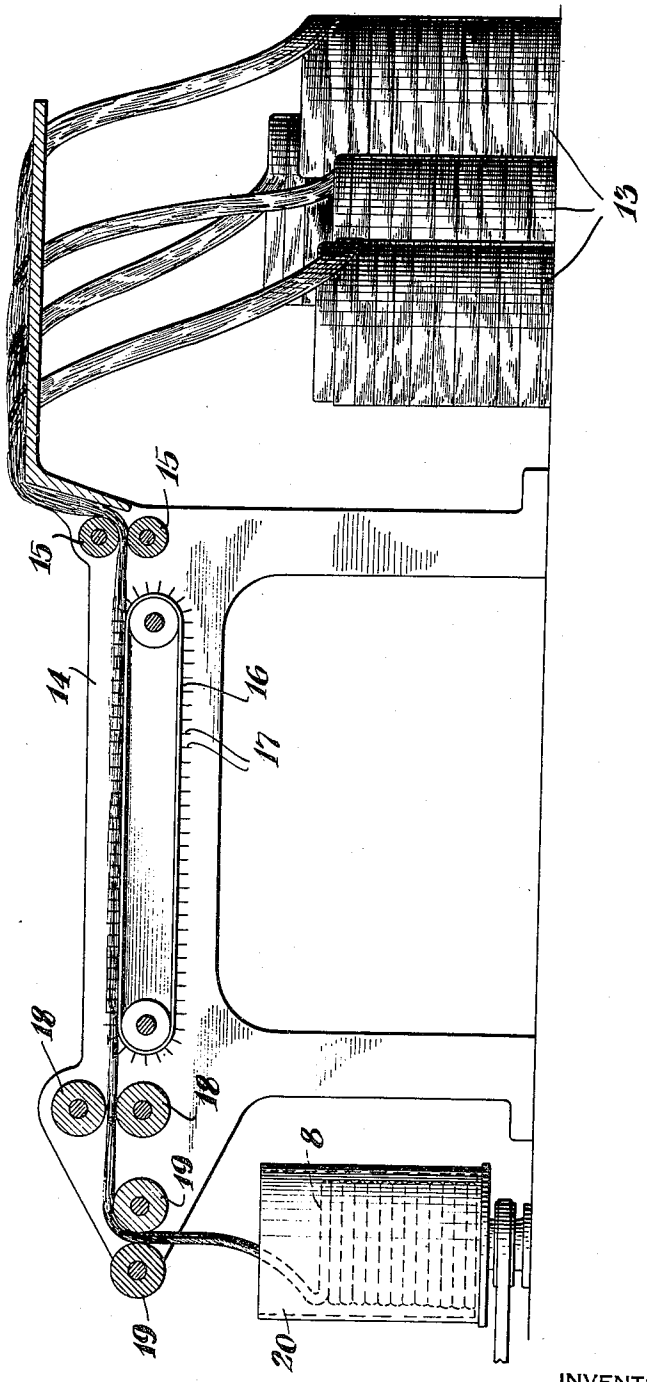


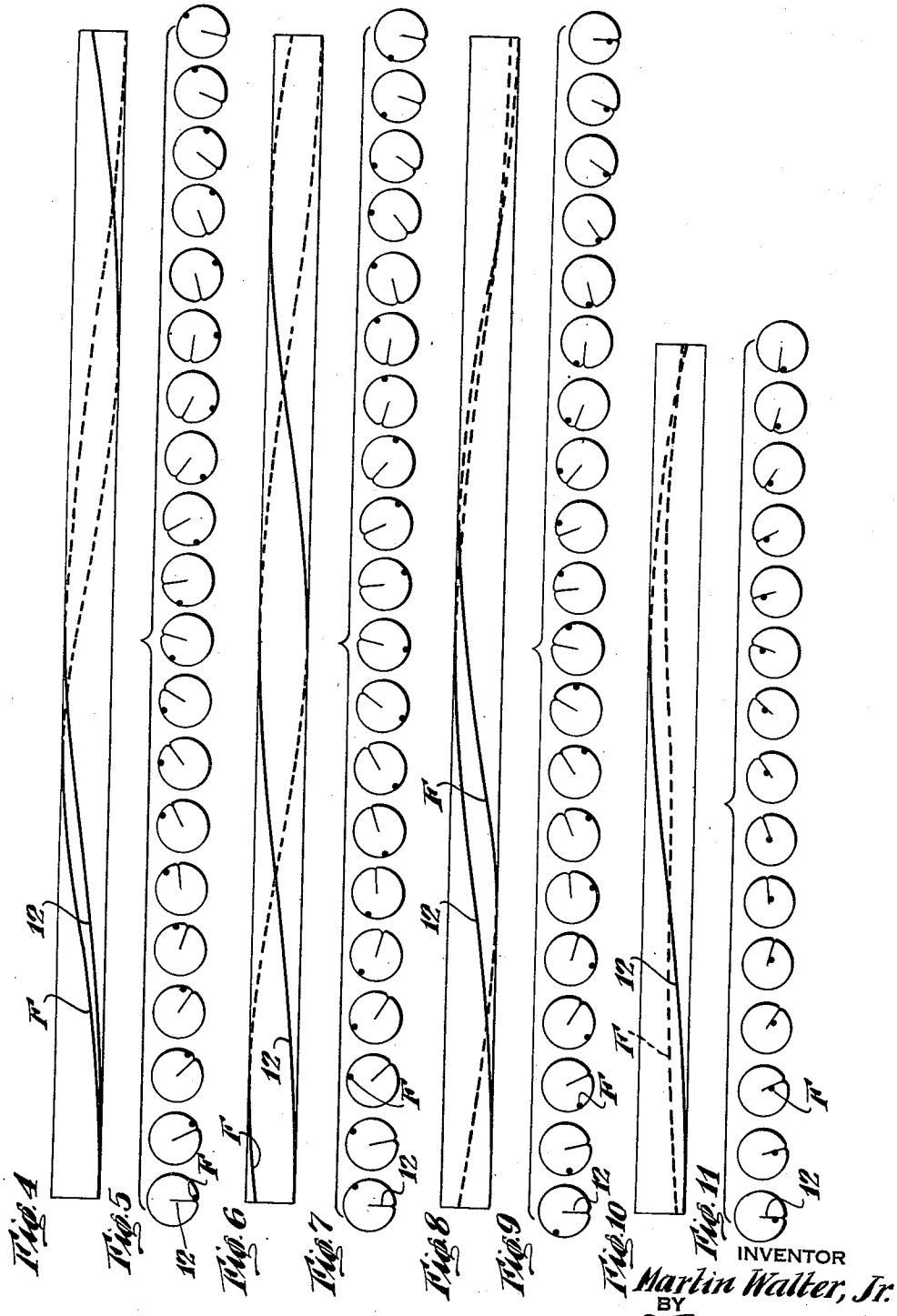
Fig. 3

INVENTOR
Martin Walter, Jr.
BY
Robert Becker
ATTORNEY

Oct. 15, 1940. M. WALTER, JR 2,218,224

ART OF ROPE MAKING

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INVENTOR
Martin Walter, Jr.
BY
ATTORNEY

Oct. 15, 1940. M. WALTER, JR 2,218,224

ART OF ROPE MAKING

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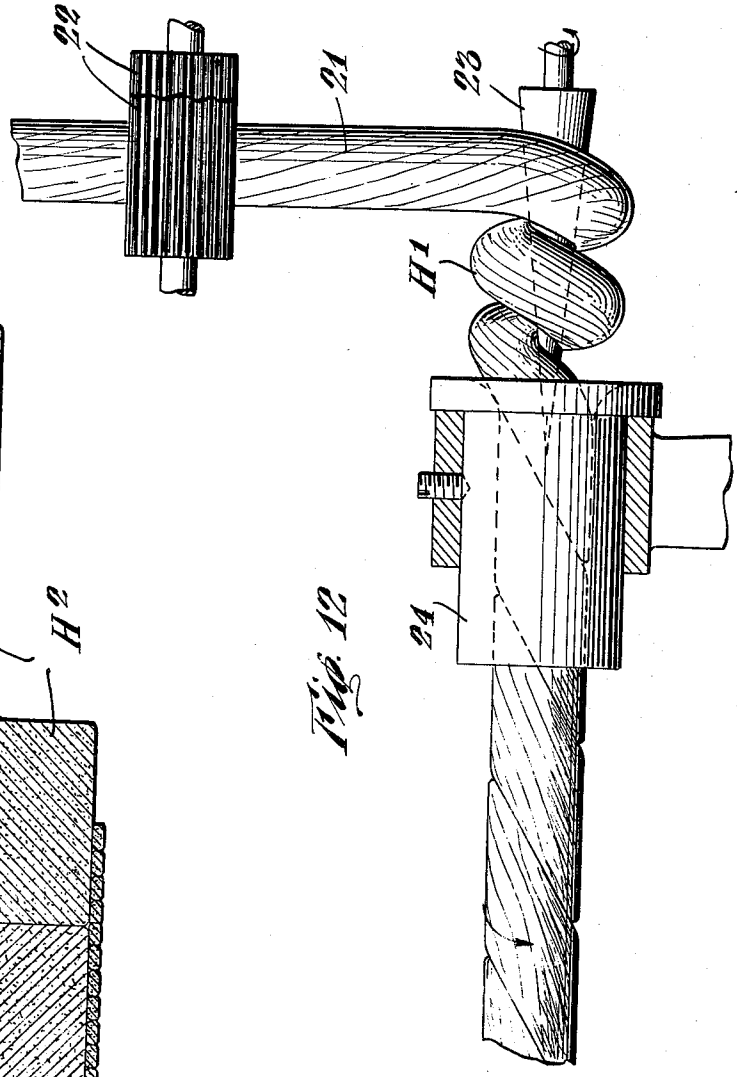


Fig. 12

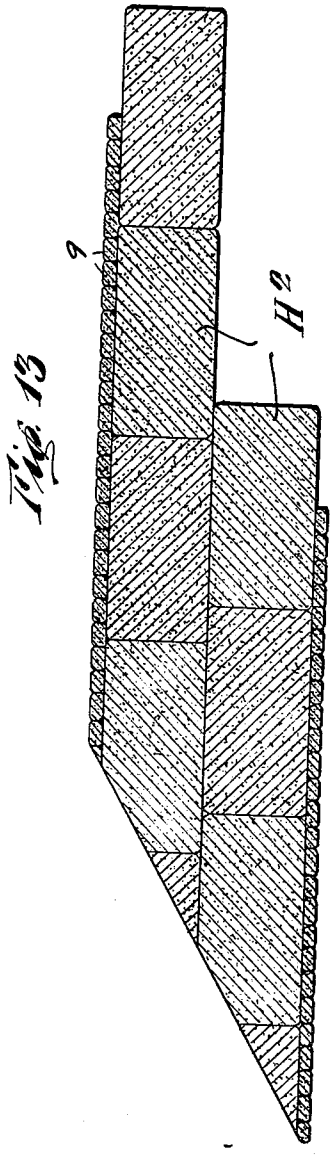


Fig. 13

INVENTOR
Martin Walter, Jr.
BY
Arthur Becker
ATTORNEY

Oct. 15, 1940.

M. WALTER, JR

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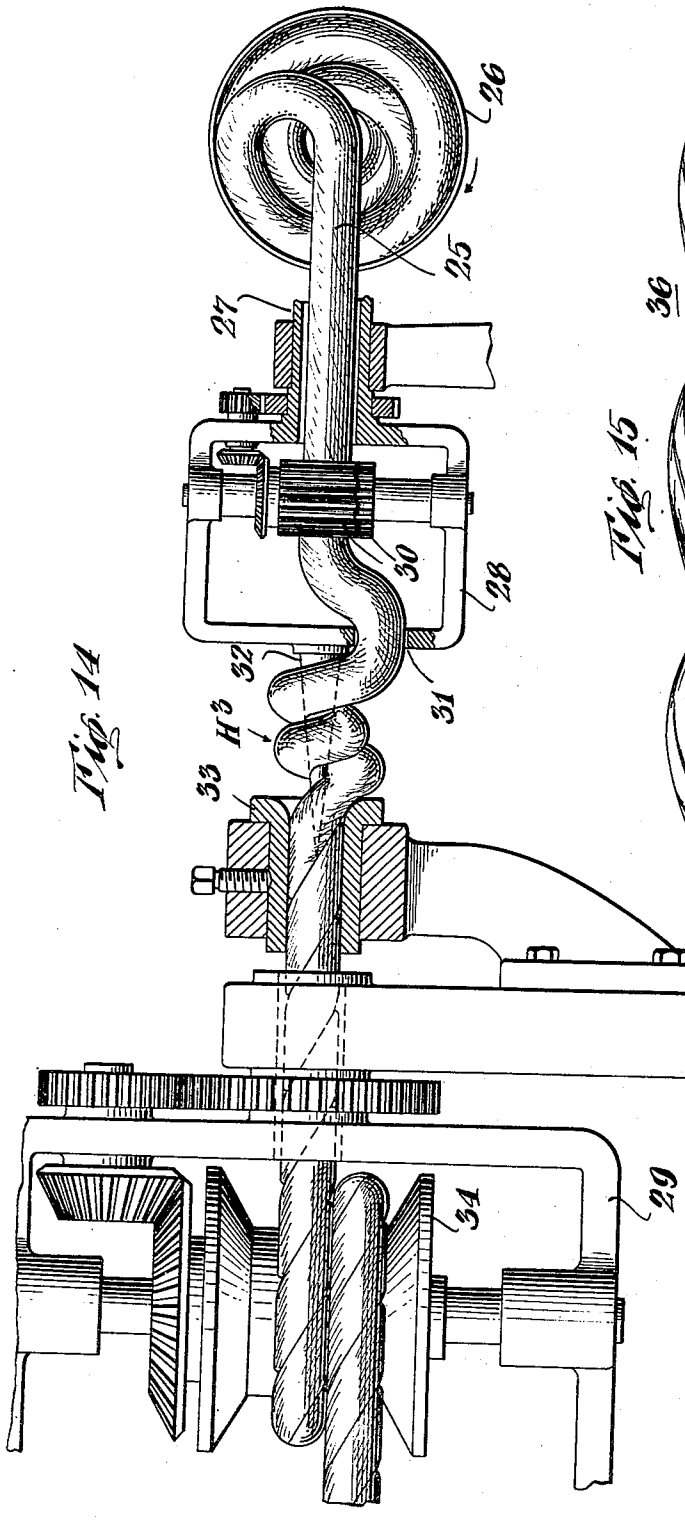


Fig. 14

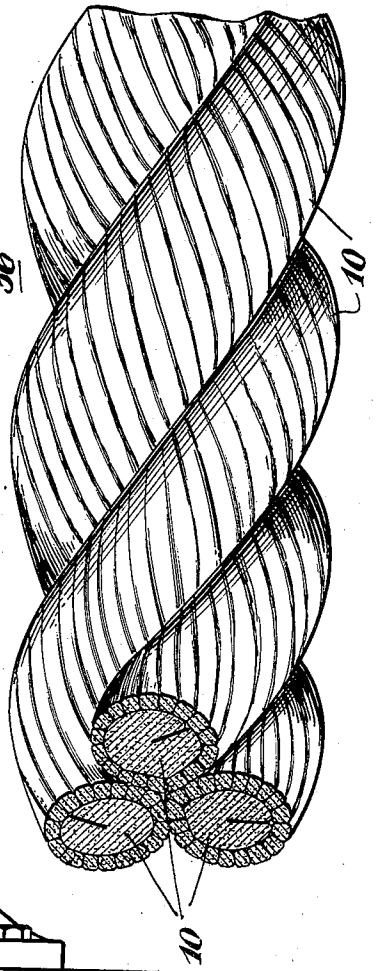


Fig. 15

INVENTOR

Martin Walter, Jr.

BY

ATTORNEY

Patented Oct. 15, 1940

2,218,224

UNITED STATES PATENT OFFICE

2,218,224

ART OF ROPE MAKING

Martin Walter, Jr., South Dartmouth, Mass., assignor to New Bedford Cordage Co., New Bedford, Mass., a corporation of Massachusetts

Application February 10, 1939, Serial No. 255,582

12 Claims. (Cl. 57—144)

The present invention relates to the art of rope-making, and has for its main object and feature the production of a fibrous rope strand provided with a resilient core capable of taking up sudden jerks or strains to which the strand, or a rope composed of a number of strands, may be subjected, to thereby prevent or minimize permanent elongation of the strand or of the fibrous assemblage of which the core is composed.

In the accompanying drawings the invention is shown in several concrete and preferred forms in which

Fig. 1 is a diagrammatic view showing a forming machine embodying the invention;

Fig. 2 is a perspective view of the novel strand of my invention with the cover yarn partly removed to expose the core;

Fig. 3 is a diagrammatic view of means for pretwisting the fibrous elements of an assemblage, as one step in my invention;

Figs. 4 to 11 inclusive are diagrammatic views of the relation between the slit of the helix and a pretwisted fiber, Figs. 4, 6, 8 and 10 being longitudinal views, and each of Figs. 5, 7, 9 and 11 consisting of a series of sectional diagrams taken transversely of Figs. 4, 6, 8 and 10.

Fig. 12 is a modification of Fig. 1;

Fig. 13 is a longitudinal sectional view of a strand produced by the device of Fig. 12;

Fig. 14 is a second modification of Fig. 1;

Fig. 15 is a perspective view of a rope embodying the strands of my invention; and

Fig. 16 is a detail sectional view on an enlarged scale of the forming tube and adjacent quill.

The principle of the invention can most readily be understood by considering Figs. 1 and 16 which show the conventional forming machine consisting of a rotating frame 1 mounted in suitable bearings 2 and 3, the latter of which is hollow, said frame carrying a rotating capstan 4 and a take-up reel 5; 6 is the forming tube which is stationary. In front of this forming tube, and extending partly into it, is a guide or quill 7 around which latter an assemblage of fibrous elements 8, that is to constitute the core of the strand to be formed, is passed. 9 indicates yarns that are served on the core to produce one or more layers of covering material.

It will be understood that, in the passage of assemblage 8, from rotatable container 8a, over the quill, the latter generates said assemblage, as a unit, into a helix H which is pulled off the quill by the capstan, into the forming tube and through hollow bearing 3 by the action of the rotating capstan in the rotating frame. The helical core thus formed is served with covering yarn as it enters the forming tube, and the strand 10 so produced after passing over the pulling capstan is wound up on reel 5. Helix H is at first open, the convolutions being separated by a helical slot, which eventually, owing to the compression of the forming tube and the cover yarns, is narrowed into a mere slit. The cover yarns are served in the same direction as the formation of the helix.

Strand 10 is shown in detail in Fig. 2 where 11 indicates the core which as a unit has substantially the form of a helix, the convolutions of which are in contact and are delimited by a substantially helical slit 12. In this instance, two layers of covering yarn 9 are used.

The fibrous elements of assemblage 8 can be either slivers or yarn; preferably, slivers are used. In Fig. 3, a method and means that may be used to prepare assemblage 8 are shown. 13 indicates piles of slivers or roving that are fed into a spreader or drawframe 14 passing between rollers 15 to apron or chain 16, provided with pins 17, and thence between drafting rolls 18 and guide rolls 19. 20 indicates a rotatable receiving container which rotates at a predetermined speed with reference to the speed of the advancing slivers to thereby impart a desired preliminary twist to the fibrous elements and producing assemblage 8 which is subsequently fed into the forming machine. In the present instance, the preliminary twist is in the same direction as the twist imparted to the fibers by the forming machine, so that the twist of the fibers in the finished core is of a different pitch from that of the helix. This cumulative twist locks the individual fibrous elements together and must not be confused with the formation of the core into a helix. By reason of this twist, the fibrous elements of the core can be rendered less resilient than is the helical core as a unit, so that any sudden shock to which the strand may be subjected will be compensated for by the helical core as a unit.

In Figs. 4 to 11 inclusive are shown a series of diagrams showing a typical relation of the helix of the core to the twist of the individual fiber. Figs. 4, 6, 8 and 10 show successive lengths of the core diagrammed longitudinally. Each of Figs. 5, 7, 9 and 11 is a series of sectional diagrams. The slit is indicated at 12 and the individual fiber or yarn at F. Assuming that fiber F, which we are studying, occupies a position immediately adjacent one side of slit 12, as indicated in the left-hand sectional diagram of Fig. 5, it will be seen that the twist of fiber F is not parallel to the

helix of the core. At the extreme right-hand sectional diagram of Fig. 5, the helix has made one complete turn but fiber F is now widely separated from the slit. The progression continues during the next turn of the helix as indicated in Figs. 6 and 7 and the fiber is now approaching the other side of the slit. This becomes more and more pronounced as we study Figs. 8 and 9, and in the last four sectional diagrams at the right-hand end of Fig. 9 the fiber has reached the other side of the slit and now begins a detour around said slit. This detour continues in Figs. 10 and 11 where it will be seen that the fiber eventually passes around the bottom of the slit and then down on the other side thereof until it reaches its initial position. It will, of course, be understood that these diagrams are highly idealized so far as the twist of the fiber is concerned.

Preferably the pretwist of the fibrous elements and the formation of the assemblage into a helix are in the same direction, but it will be understood that they may be in opposite directions for obviously, both the pretwisting and the helical formation may be in either direction. So, likewise, the pitch of the twist and the pitch of the helix may vary in accordance with different requirements.

In Fig. 12 is shown a modification of Fig. 1. The object here is to get a more pronounced pitch of the helix than could be obtained by the action of the forming machine. Here the assemblage 21 is positively fed by two fluted rollers 22 from the container, instead of being merely pulled out as in Fig. 1. Quill 23 is here longer and may be concavely tapered as before, can be fluted to better feed the assemblage and is positively driven in the same direction as the rotating frame (not shown) of the forming machine but at a greater relative speed so as to produce a helix H1 that has a very short pitch. Forming tube 24 is stationary, and the cover yarns have been omitted for the sake of simplicity. The core produced by this form of the invention is shown in Fig. 13, a sectional view, from which it appears that the convolutions H2 of the helix are in overlapping relation.

If it is desired to form a helix, the convolutions of which run in the opposite direction from that previously noted and still use the same forming machine, the expedient shown in Fig. 14 can be resorted to. As there shown, assemblage 25 is drawn from a rotating container 26 and passed through the hollow bearing 27 of a rotating frame 28 turning in the opposite direction from that of frame 29 of the forming machine. Mounted in frame 28 is a pair of fluted and positively driven feed rolls 30 that advances the assemblage which latter passes out of an eccentrically disposed opening 31 in the frame and is then trained over rotating quill 32, thereby forming said assemblage into a pronounced helix H3 that then enters stationary forming tube 33 and is lengthened or partially unwound by rotating capstan 34 of rotating frame 29.

The strands produced by any of these various methods can be laid into a rope 36 in either direction in any of the different ways known in the art as shown, for example, in Fig. 15 in which 10 indicates the strands, here three in number.

Likewise, it will be understood that the rope shown as an example in Fig. 15 becomes a lessom when laid into a cable.

I claim:

1. In a fibrous rope strand having a core and a covering, a core consisting of an assemblage of fibrous elements, said core consisting of a single unit having substantially the form of a helix the convolutions of which are in contact and delimited by a substantially helical slit.

2. In a fibrous rope strand having a core and a covering, a core that as a unit is relatively resilient and that consists of an assemblage of fibrous elements, said elements being less resilient than the core is as a unit, said core consisting of a single unit having substantially the form of a helix the convolutions of which are in contact and delimited by a substantially helical slit.

3. In a fibrous rope strand having a core and a covering, a core consisting of an assemblage of pre-twisted fibrous elements, said core consisting of a single unit having substantially the form of a helix the convolutions of which are in contact and delimited by a substantially helical slit.

4. In a fibrous rope strand having a core and a covering, a core consisting of an assemblage of fibrous elements, said core consisting of a single unit having substantially the form of a helix the convolutions of which are in contact and in overlapping relation and delimited by a substantially helical slit.

5. In a fibrous rope strand having a core and a covering, a core that as a unit is relatively resilient and that consists of an assemblage of fibrous elements, said core consisting of a single unit having substantially the form of a helix the convolutions of which are in contact and delimited by a substantially helical slit, said fibrous elements lying twisted in the core, the pitch of the twist of the fibrous elements and the pitch of the helix of the core being different.

6. A fibrous rope strand having a core and a covering, the core consisting of an assemblage of fibrous elements and consisting of a single unit having substantially the form of a helix the separate convolutions of which are in contact and delimited by a substantially helical slit, and said covering consisting of one or more layers of core yarn that surround the core in close formation and extend helically in the same direction as that of the helix of the core.

7. The method of making a fibrous rope strand having a core and wrapping which consists in: producing the core from an assemblage of fibrous elements by generating said assemblage as a unit into a helix the convolutions of which are in contact and delimited by a substantially helical slit, and serving said core with cover yarn.

8. The method of making a fibrous rope strand having a core and wrapping which consists in: producing the core from an assemblage of fibrous elements by generating said assemblage as a unit into a helix the convolutions of which are in contact and delimited by a substantially helical slit, and serving said core with cover yarn laid helically in the same direction as that of the helix of the core.

9. The method of making a fibrous rope strand having a core and wrapping which consists in: twisting the fibrous elements of an assemblage of such elements, producing a core from said assemblage of pretwisted fibrous elements by generating said assemblage as a unit into a helix the convolutions of which are in contact and delimited by a substantially helical slit, and serving said core with cover yarn.

10. The method of making a fibrous rope strand having a core and wrapping which consists in: twisting the fibrous elements of an assemblage of such elements, producing a core

from said assemblage of pretwisted fibrous elements by generating said assemblage as a unit into a helix the convolutions of which are in contact and delimited by a substantially helical slit, and serving said core with cover yarn laid helically in the same direction as that of the helix of the core.

11. The method of making a fibrous rope strand having a core and wrapping which consists in: twisting the fibrous elements of an assemblage of such elements, producing a core from said assemblage of pretwisted fibrous elements by generating said assemblage as a unit into a helix the convolutions of which are in contact and delimited by a substantially helical slit, said convolutions extending in the same direction as that of the twist of elements of the assemblage, and severing said core with cover yarn.

12. The method of making a fibrous rope strand having a core and wrapping which consists in: twisting the fibrous elements of an assemblage of such elements, producing a core from said assemblage of pretwisted fibrous elements by generating said assemblage as a unit into a helix the convolutions of which are in contact and delimited by a substantially helical slit, said convolutions extending in the same direction as that of the twist of elements of the assemblage, and serving said core with cover yarn laid helically in the same direction as the helix of the core.

MARTIN WALTER, JR.