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TOW FEEDER

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Fig. 2.

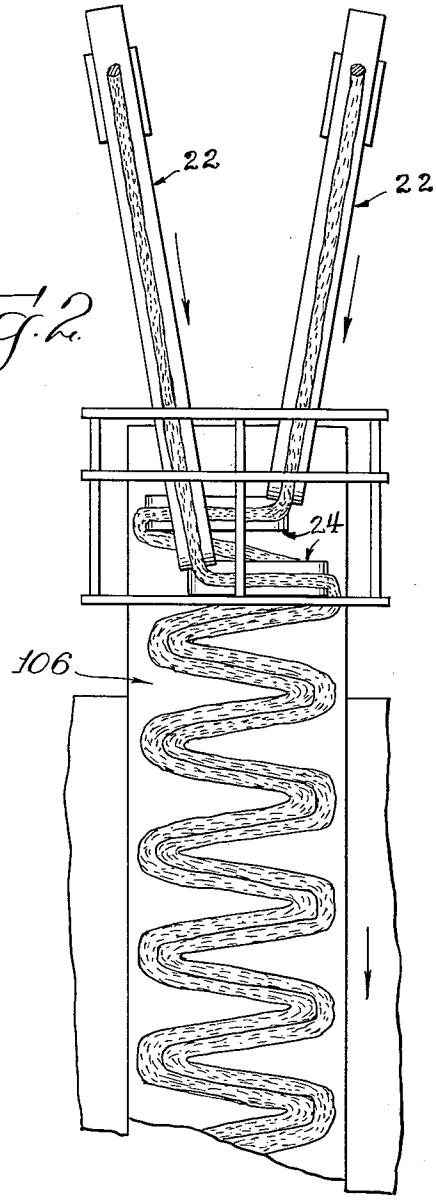
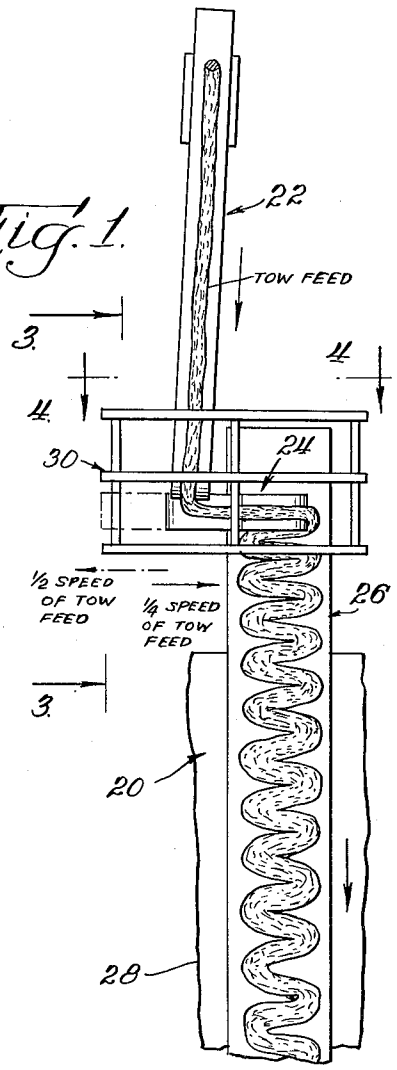


Fig. 1.



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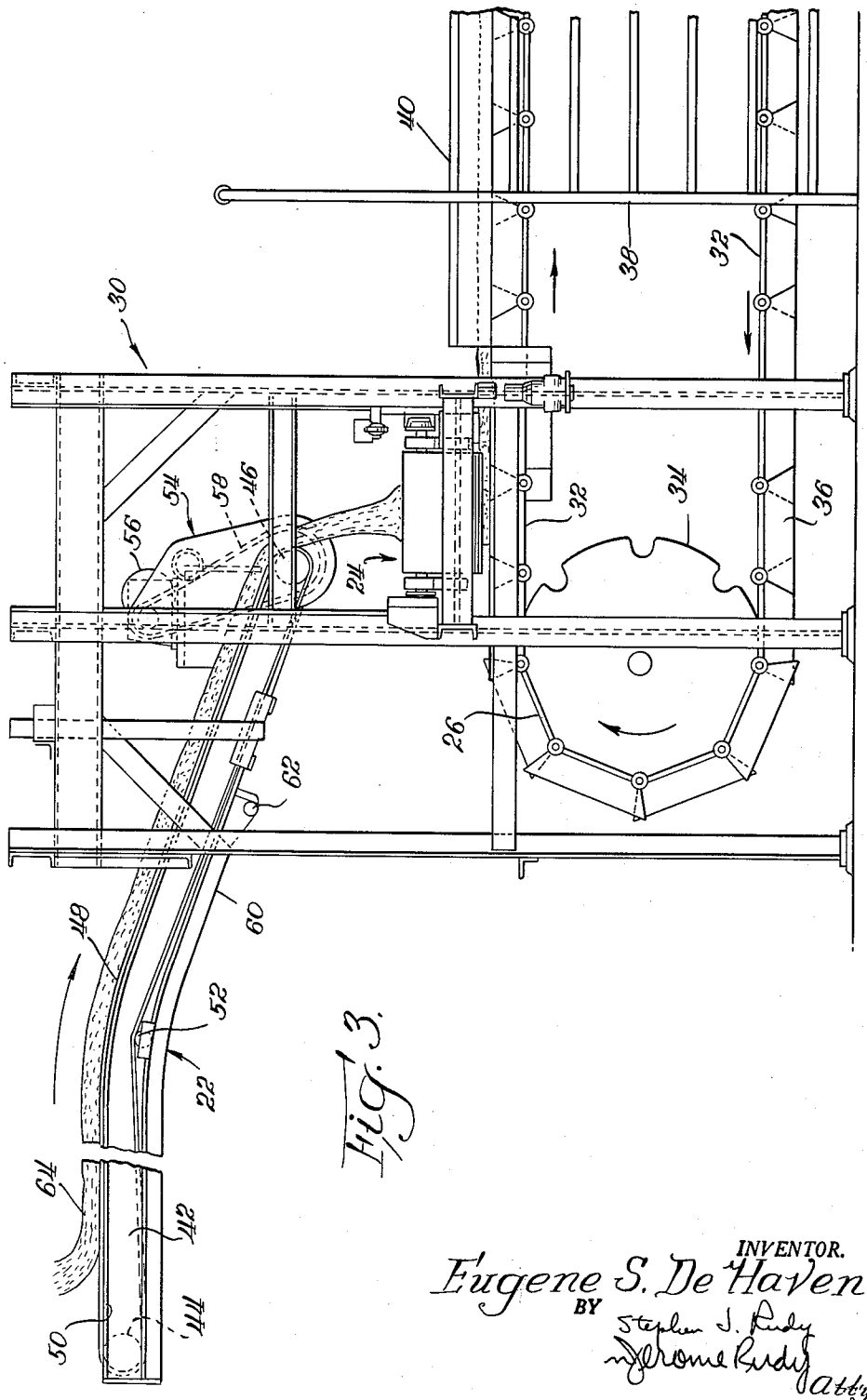


Fig. 3.

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TOW FEEDER

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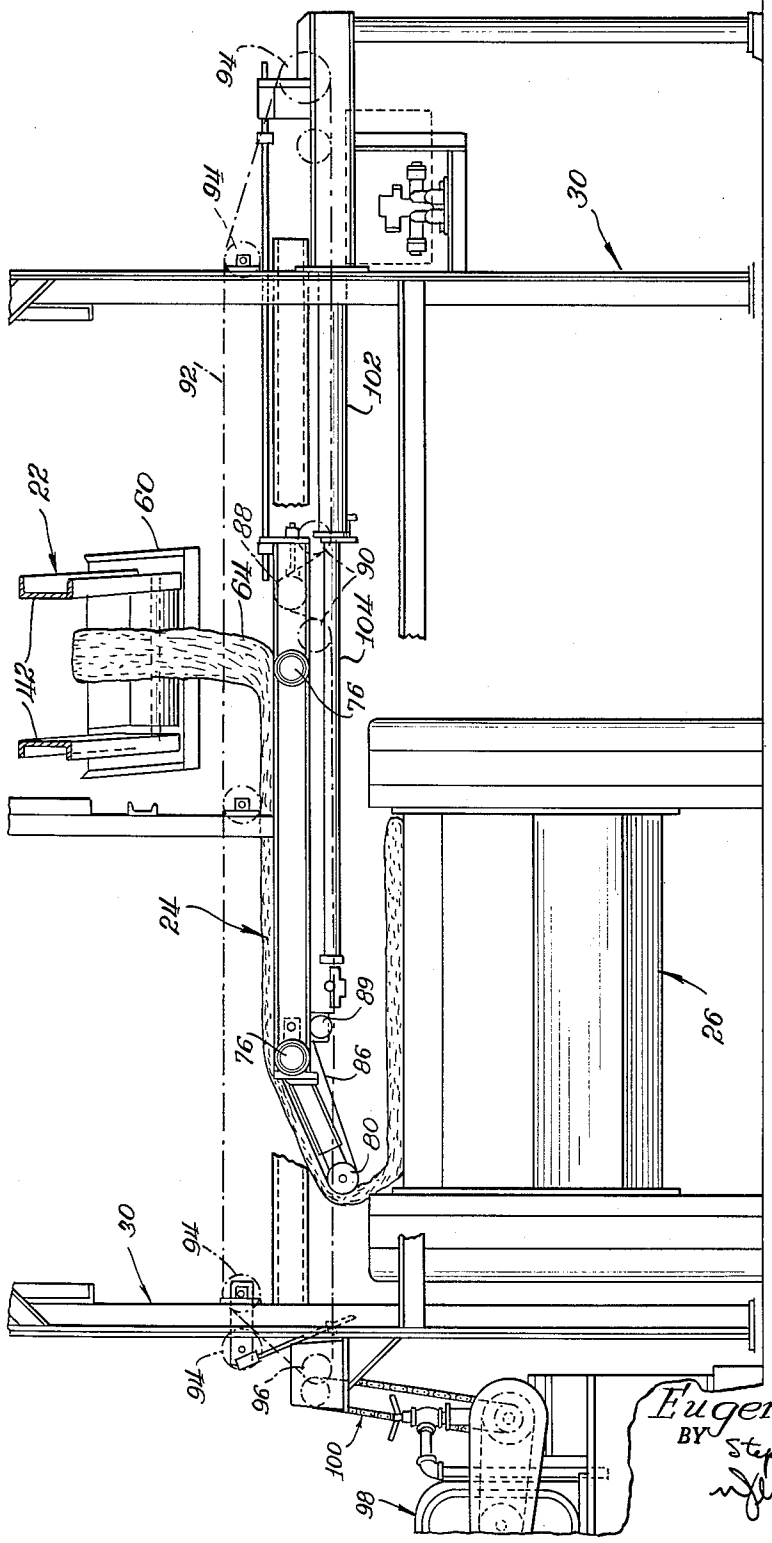


Fig. 11

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TOW FEEDER

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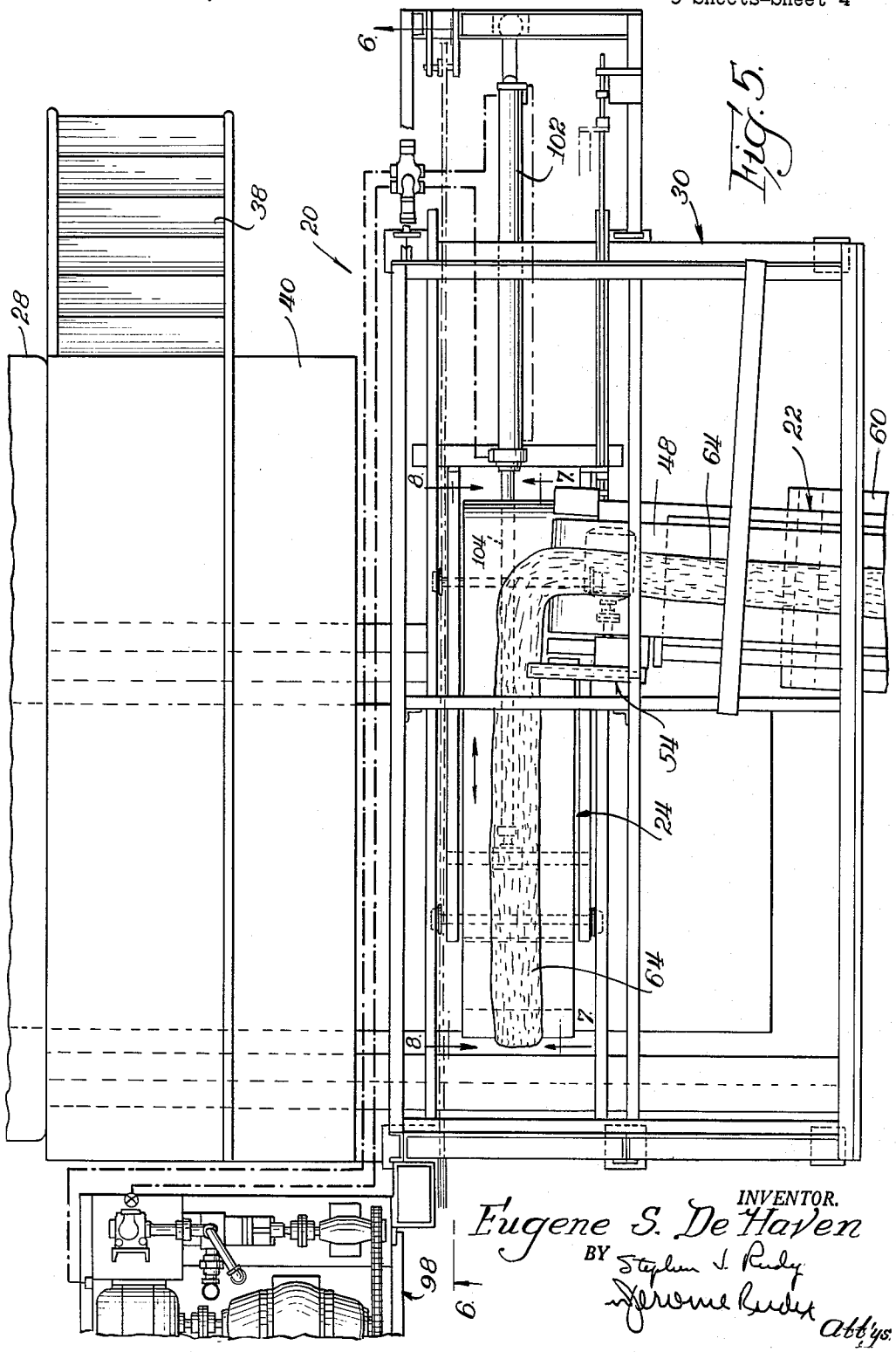


Fig. 5.

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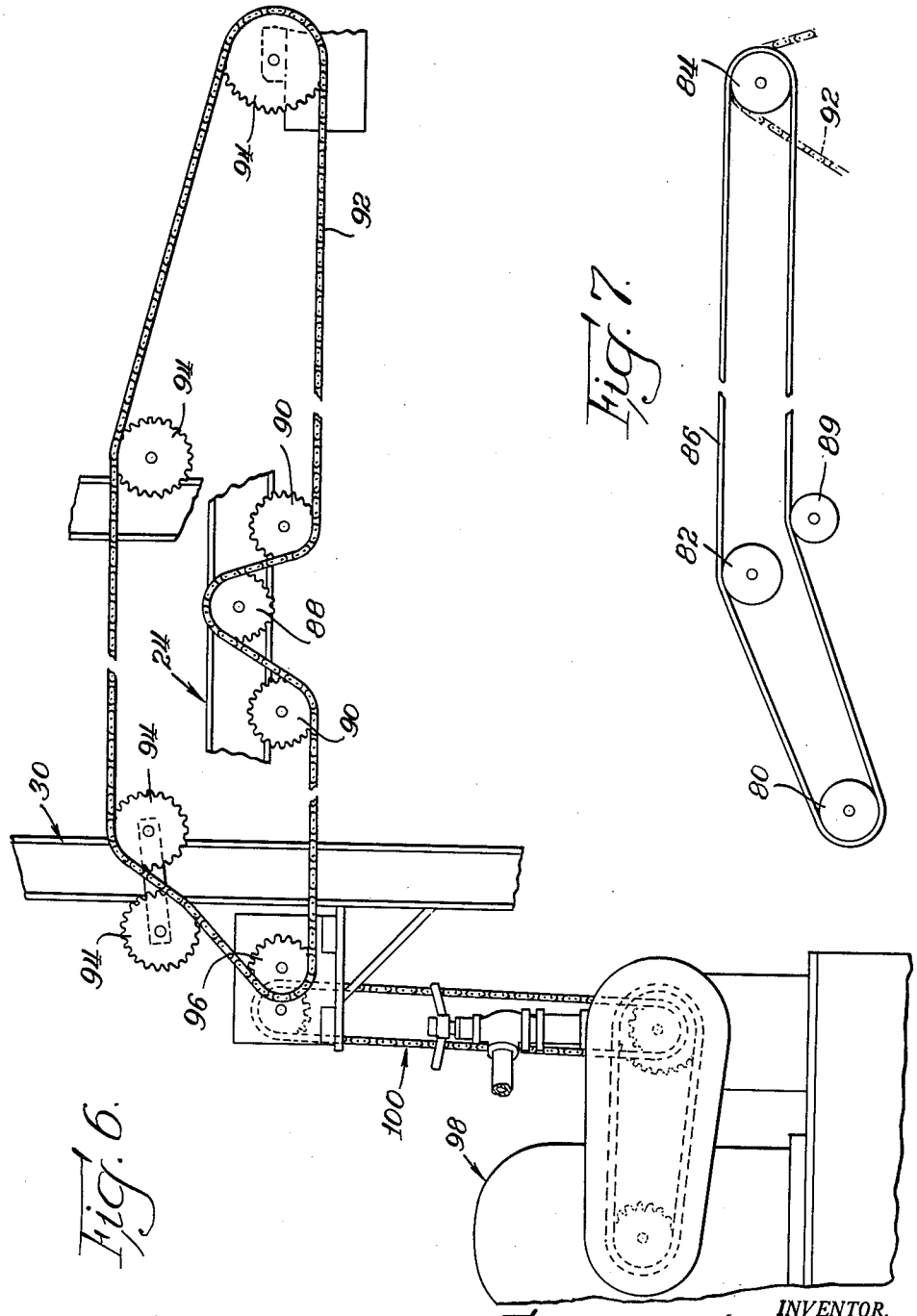


Fig. 6.

Fig. 7.

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Fig. 8a.

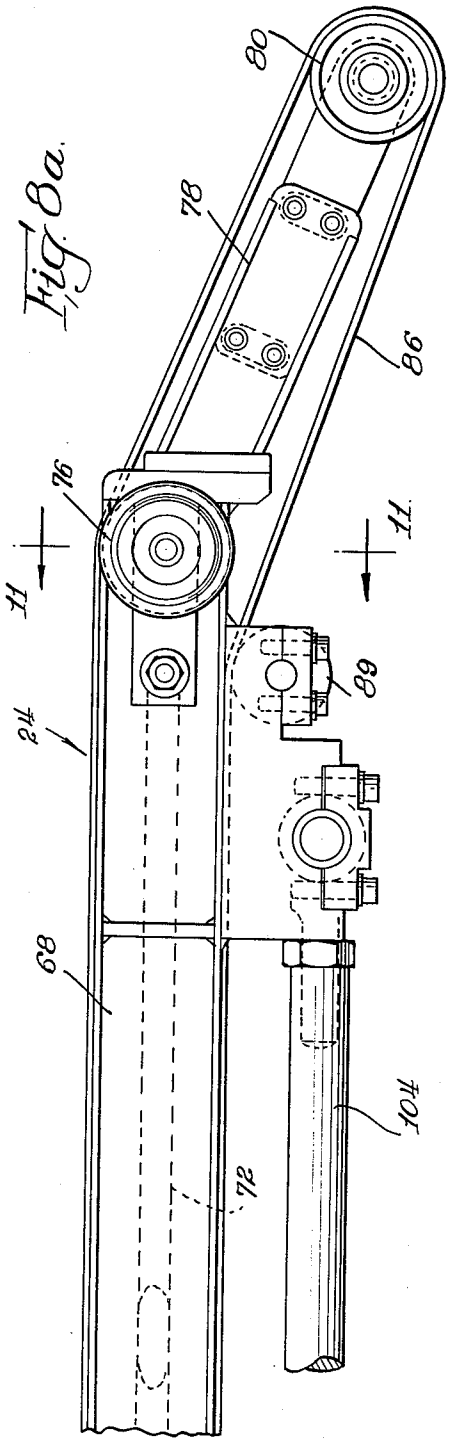
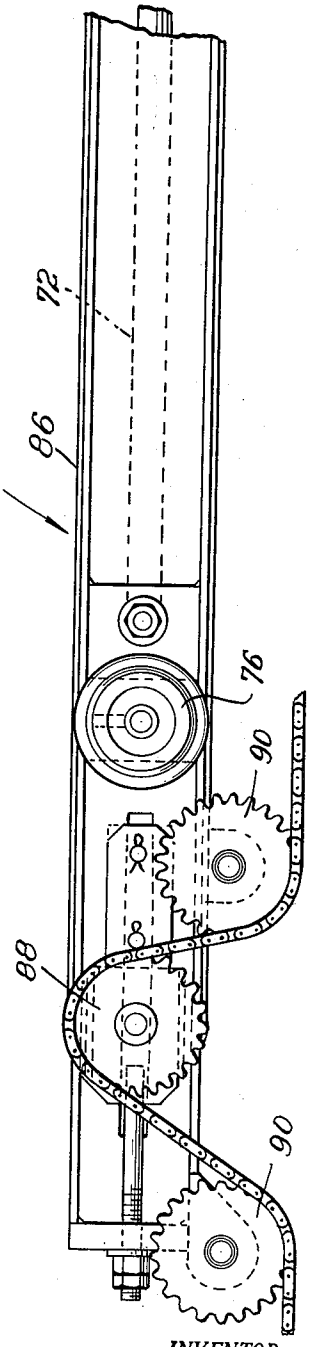


Fig. 8b.



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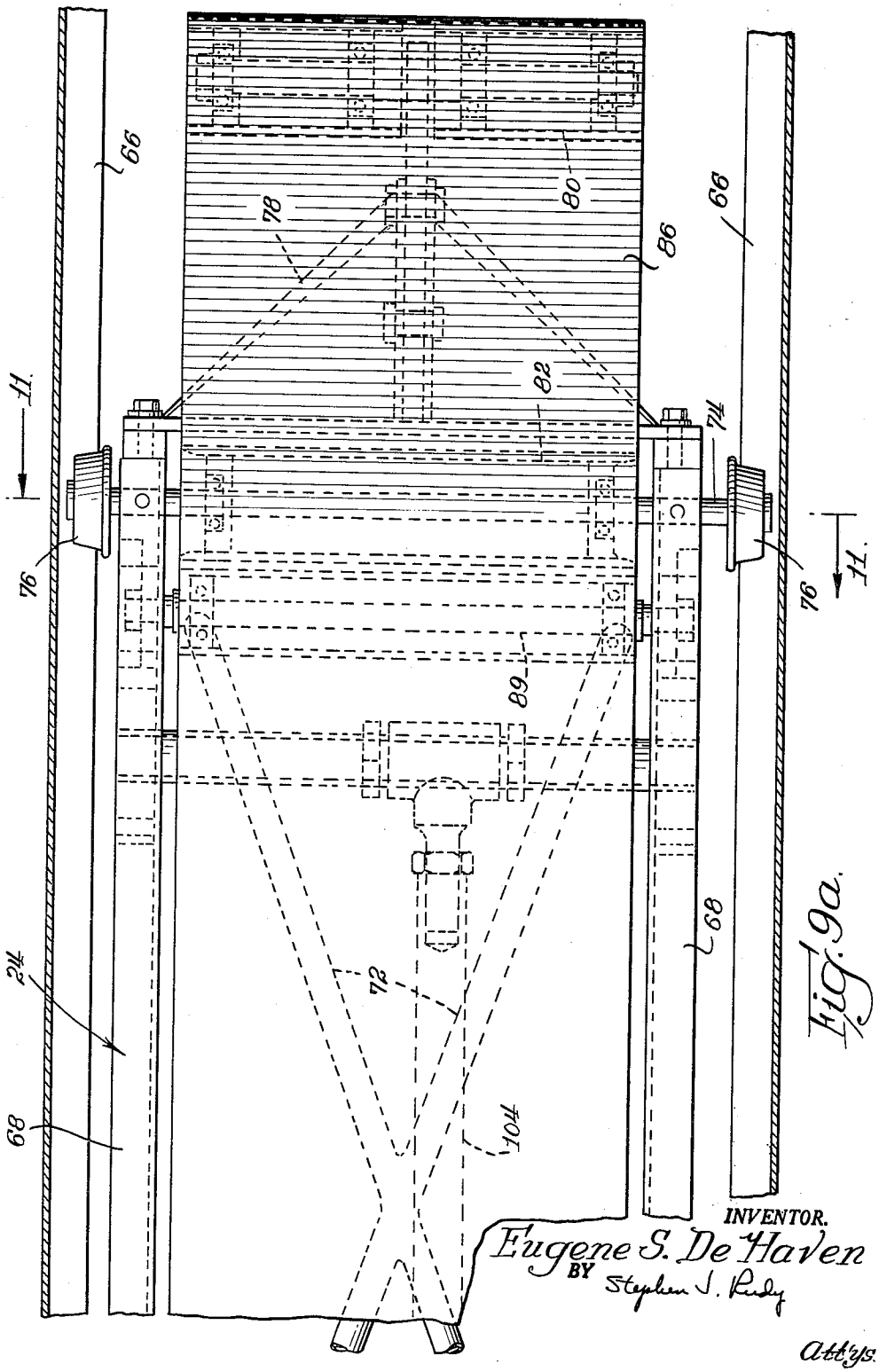


Fig. 9a.

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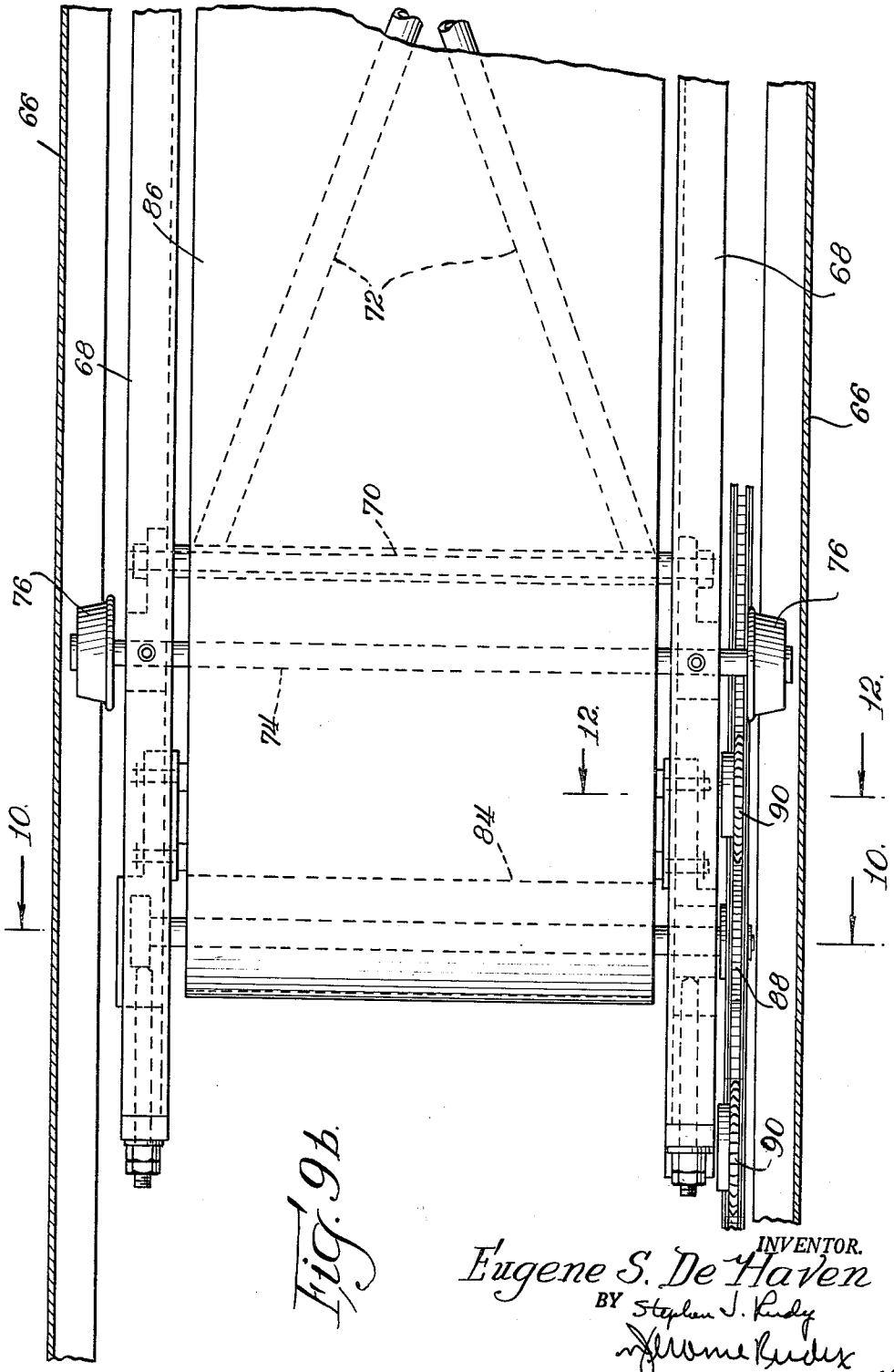


Fig. 9b.

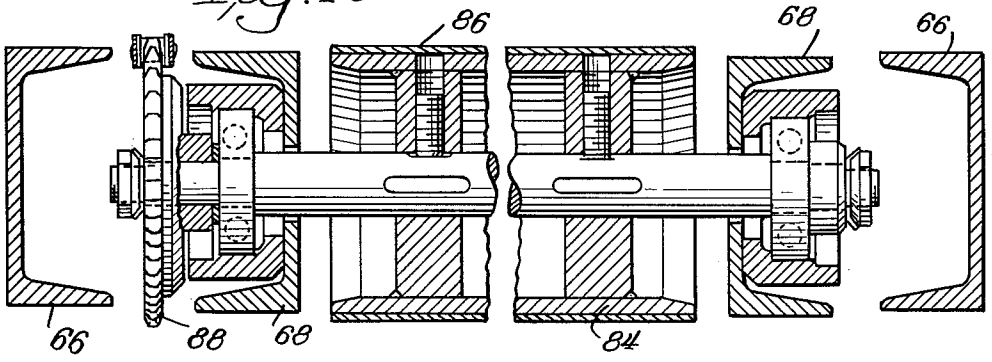
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TOW FEEDER

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Fig. 10.



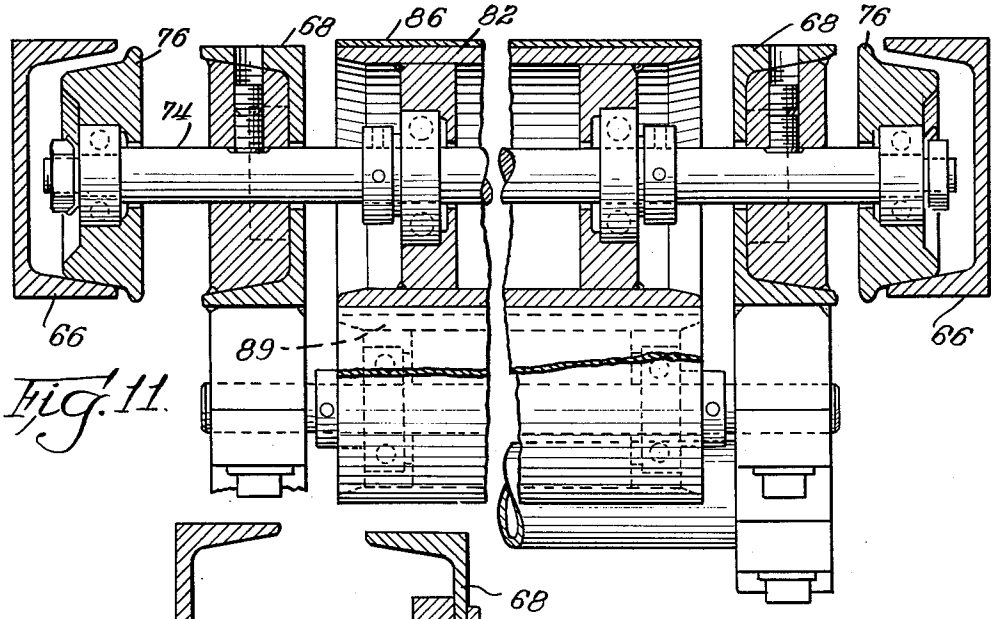


Fig. 11.

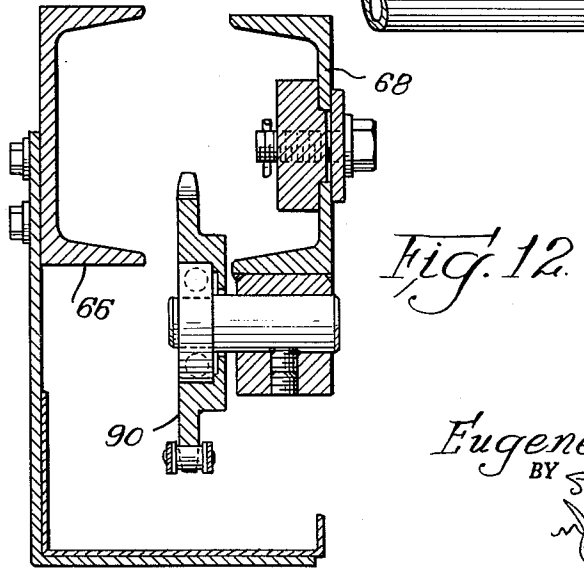


Fig. 12.

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United States Patent Office 3,104,790 Patented Sept. 24, 1963

3,104,790

TOW FEEDER

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Filed Mar. 24, 1961, Ser. No. 98,129
8 Claims. (Cl. 226—109)

This invention relates to apparatus for laying tow upon a dryer belt.

Reference is made to U.S. Patent 2,917,806, issued on December 22, 1959, which relates to an improved method for the manufacture of crimped acrylonitrile polymer fibers. The present invention is primarily concerned with that phase of the patented method relating to laying the crimped tow bundle upon a belt for passage through a drying oven.

In the processing of the wet crimped tow it is important, among other things, that the tow be handled gently so as not to stretch the crimp out of the tow, which could result if proper drying belt speed in relation to tow feeding is not maintained, or if the tow bundle is allowed to dangle more than a given amount.

The tow feeder of the present invention will lay a wet tow bundle upon a dryer belt evenly, with proper support given to the tow during handling, so that the crimp is not stretched out of the tow, and the tow is not otherwise distorted. An important feature pertains to the maintenance of constant speed of the upper surface of a feed belt relative to the ground, while a carriage supporting the feed belt oscillates across a slowly moving, relatively wide, dryer belt.

The main object of this invention is to provide a tow feeder for handling crimped polymer fibers during the manufacture thereof.

A more specific object is to provide a tow feeder which will lay a wet crimped tow bundle upon a dryer belt evenly, with proper support given to the tow so that the crimp is not stretched out, and not otherwise distorted.

Another specific object is to provide a tow feeder wherein the upper surface of the feed belt is maintained at constant speed relative to the ground, while a carriage supporting the feed belt oscillates across a slowly moving, relatively wide, dryer belt.

These and other objects and features of the invention will become more apparent from the following description and accompanying drawings wherein:

FIG. 1 is a schematic plan view of a single unit tow feeder arrangement incorporating the principles of the invention;

FIG. 2 is a schematic plan view of a double unit tow feeder arrangement incorporating the principles of the invention;

FIG. 3 is an elevation view of the tow feeder arrangement as seen from line 3—3 in FIG. 1;

FIG. 4 is an elevation view of the tow feeder arrangement as seen from line 4—4 in FIG. 1;

FIG. 5 is a plan view, similar to FIG. 1 but in greater detail;

FIG. 6 is an elevation view, in broken sections, of a chain drive as seen from line 6—6 in FIG. 5;

FIG. 7 is an elevation view, in broken sections, of a carriage belt as seen from line 7—7 in FIG. 5;

FIG. 8*a* is a fragmentary elevation view of a feed carriage used in the tow feeder arrangement of FIG. 1, and showing an end portion thereof;

FIG. 8*b* is the same as FIG. 8*a*, but showing the opposite end portion thereof;

FIG. 9*a* is a fragmentary plan view of the portion of the feed carriage shown in FIG. 8*a*;

FIG. 9*b* is a fragmentary plan view of the portion of the feed carriage shown in FIG. 8*b*;

FIG. 10 is a section view as seen from line 10—10 in FIG. 9*b*;

FIG. 11 is a section view as seen from line 11—11 in FIG. 9*a*; and

FIG. 12 is a section view as seen from line 12—12 in FIG. 9*b*.

Referring now to FIG. 1 of the drawings, the numeral 20 refers to a single unit tow feeder arrangement incorporating the principles of the invention, which arrangement basically includes a crimper discharge conveyor assemblage 22, a carriage assembly 24, and an endless dryer belt or apron 26, which is arranged to move through a tow drying oven 28.

As best seen in FIGS. 3, 4 and 5, the above mentioned units of the tow feeder arrangement 20, are supported by a frame means 30, consisting of generally horizontally and vertically arranged beams and columnar members held together by fastening means and/or welding, as the case may be. The dryer belt 26, is preferably formed of rectangular plate members 32, which are pivotally interconnected in a well known manner, whereby the belt may be operatively associated with a drive, or sprocket wheel 34. The belt, which may have side panels 36, is supported upon track means (not shown) so that the upper surface of the belt will move in a horizontal plane extending beneath the carriage assembly 24, and through the drying oven 28. Movement of the belt 26 may be regulated in accordance with operational requirements, which under the conditions of the example set forth herein, is preferably within a speed range of from one to three feet per minute. A ladder 38 is arranged for access to a platform, or catwalk 40 which extends above the belt 26 and affords convenient adjustment and maintenance of the tow feeder components.

The crimper discharge conveyor assembly 22, includes a pair of spaced channel members 42, which are sloped downwardly toward the carriage assembly 24, as best seen in FIG. 3. A roller 44 is rotatably mounted between the channel members toward the receiving end of the conveyor assembly, while a similar roller 46 is likewise mounted at the discharge end. An endless belt 48 is arranged between the channel members, which belt is mounted upon the rollers 44 and 46. The upper flight of the belt 48 is supported upon a plate 50 arranged between the channel members 42, while the lower flight of the belt is operatively supported upon a roller 52. A belt drive means 54, arranged upon the conveyor assembly 22, includes a motor 56, which is connected to the roller 46 by a drive chain 58 and appropriate pulley means. A drip pan 60, positioned beneath the belt 48, has a pipe 62 connected at the lower extremity, for carrying away liquid which drips from a tow bundle 64 as it is moved upon the conveyor. The conveyor assembly 22 is positioned so that the tow bundle 64 is deposited upon the belt 48 as it emerges from a crimper (not shown), and is delivered to the mid-region of the carriage asembly 24.

The carriage assembly 24, is mounted for reciprocal movement upon a pair of tracks 66, formed of channel members supported by the frame means 30. The carriage assembly includes a pair of channel members 68 maintained in spaced parallel relation by a through bolt 70, and cross rods 72. Toward each end of the carriage assembly is arranged a shaft, or axle 74 extending through the channel members 68 and having mounted at each end a wheel 76 adapted for rolling engagement within the tracks 66. Mounted upon the carriage assembly at the discharge end, is an arm arrangement 78 adapted to support a roller 80. A roller 82 is rotatably mounted upon the axle 74 toward the discharge end of the carriage assembly, while a similar roller 84 is mounted upon the axle 74 at the opposite end of the carriage assembly. An endless belt 86 is mounted upon the rollers 80, 82,

and 84, which belt is driven by a sprocket wheel 88 affixed to an end of the axle supporting the roller 84. The pitch diameter of the sprocket wheel 88 is equal to the diameter of the roller 84 plus twice the thickness of the belt 86. An idler roller 89 is arranged beneath the carriage to support the belt as it passes beneath the carriage.

Mounted upon one of the channel members 68 is a pair of idler sprocket wheels 90 which project beneath the carriage assembly and are located in the same vertical plane as the sprocket wheel 88. An endless drive chain 92 operatively engages the sprocket wheels 88 and 90, which drive chain engages a plurality of idler sprocket wheels 94 rotatably supported upon the frame means 30, as best seen in FIG. 6. The chain 92 is driven by a sprocket wheel 96 which is rotated by a motor means 98 via a chain drive linkage 100, as shown. The motor means may be regulated to drive the chain 92 at any speed necessary in a given operating set up, however, in a production set up utilizing the disclosed apapratus, a speed of approximately 200 feet per minute was found to be satisfactory.

Means to reciprocate the carriage assembly 24, include a cylinder 102 mounted upon the frame 30, and having a piston with a piston rod 104, the end of which is connected to the carriage, as best seen in FIG. 4. Means are provided to admit a pressure fluid sequentially to the opposite ends of the cylinder 102, whereby the discharge end of the carriage will traverse the dryer belt 26. The ratio of advance speed of the carriage asembly, to retraction speed, is governed by the desired ratio of tow feed in feet per minute, to traverse in feet per minute. Thus, if "*f*" is the tow feed rate, and "*n*" is the ratio of feet of tow to be fed, to feet of traverse of the carriage assembly, then the carriage advance speed "S*a*" and the carriage retraction speed "S*r*" is given by the following equations:

$$S_a = \frac{f}{n+1}$$

$$S_r = \frac{f}{n-1}$$

If in the machine disclosed $n=3$, and $f=200$ feet/min., then $Sa=50$ feet/min. and $Sr=100$ feet/min.

It will be observed that regardless of the direction of movement of the carriage assembly 24, the feed rate of the tow upon the dryer belt 26, will remain constant; in the given example, such tow rate will remain constant at 200 ft./min. This is true because, as pointed out, the pitch diameter of the drive sprocket 88 equals the diameter of the roller 84, plus twice the thickness of the belt 86, which results in the upper surface of the belt being driven at a constant speed relative to the ground.

It will be apparent from the foregoing description that the disclosed embodiment of the invention will satisfy the objectives set forth hereinbefore.

A double unit tow feeder arrangement is illustrated in FIG. 2, which utilizes two feeder assemblies as above described, arranged to deposit a tow bundle upon a double width dryer belt 106. In all other respects, the arrangement shown in FIG. 2 is similar to the single unit illustrated and described in connection with FIG. 1. In such manner, the productive capacity for drying the tow may be conveniently doubled.

The foregoing description has been given in detail without thought of limitation since the inventive principles involved are capable of assuming other forms without departing from the spirit of the invention or the scope of the following claims.

What is claimed is:

1. A tow feeder arrangement comprising in combination, a tow discharge conveyor assemblage, a reciprocable carriage assembly for receiving tow from the conveyor assemblage said carriage assembly having differing advance and retraction speeds, and movable means arranged for receiving tow from the carriage assembly, said carriage assembly having a movable belt means the speed of which is maintained constant relative to a fixed reference point as the carriage reciprocates.

2. A tow feeder arrangement comprising in combination a tow discharge conveyor assemblage, a reciprocable carriage assembly for receiving tow from the conveyor assemblage said carriage assembly having differing advance and retraction speeds, and movable means arranged for receiving tow from the carriage assembly, said carriage assembly having an endless belt which is driven so that the speed remains constant in one direction relative to the ground as the carriage reciprocates.

3. A tow feeder arrangement comprising in combination a tow discharge conveyor assemblage, a frame means, a carriage assembly having an endless belt, said carriage assembly being supported by said frame means for reciprocal movement in a horizontal plane, said carriage assembly having differing advance and retraction speeds, a belt means arranged for receiving tow from the carriage assembly, and an endless drive chain supported by the frame means and operatively associated with the carriage assembly in a manner so that the belt thereof may be moved in one direction at constant speed relative to the ground as the carriage is being reciprocated.

4. A tow feeder arrangement comprising in combination a tow discharge conveyor assemblage, a frame means, a carriage assembly having an endless belt, said carriage being supported by said frame means for reciprocal movement in a horizontal plane, means to reciprocate the carriage at a first speed in one direction and at a second speed in the opposite direction, a belt means arranged for receiving tow from the carriage assembly, and an endless drive chain supported by the frame means and operatively associated with the carriage assembly in a manner so that the belt thereof may be moved in one direction at constant speed relative to the ground as the carriage is being reciprocated.

5. A tow feeder arrangement, comprising in combination a tow discharge conveyor assemblage, a frame means, a carriage assembly for receiving tow from said conveyor assemblage and having an endless belt, said carriage being supported by said frame means for reciprocal movement in a horizontal plane, means to reciprocate the carriage at a first speed in one direction and at a second speed in the opposite direction, a belt means arranged for movement in a direction normal to the direction of movement of said carriage and adapted for receipt of tow from the carriage, and an endless drive chain supported by the frame means and operatively associated with the carriage assembly in a manner so that the belt thereof may be moved in one direction at constant speed relative to the ground as the carriage is being reciprocated.

6. In a tow feeder arrangement, a frame means, a carriage assembly having an endless belt with internal rollers at each end, said carriage being supported by said frame means for reciprocal movement, an endless drive chain supported by the frame means, and a sprocket wheel on one of said rollers for operative engagement by said chain, said sprocket wheel having a pitch diameter equal to the diameter of the associated roller plus twice the thickness of said belt.

7. In a tow feeder arrangement, a frame means, a carriage assembly having an endless flat belt with internal rollers at each end, said carriage being supported by said frame means for reciprocal movement in a horizontal plane, an endless drive chain movably supported by the frame means, a first sprocket wheel on one of said rollers for operative engagement by said chain, said sprocket wheel having a pitch diameter equal to the diameter of the associated roller plus twice the thickness of said belt, and a pair of idler sprocket wheels arranged for maintaining said chain in operative engagement with said first sprocket wheel.

8. In a tow feeder arrangement, a frame means, a carriage assembly having an endless flat belt with internal rollers at each end, track means mounted upon the frame means for supporting said carriage assembly for reciprocal movement in a horizontal plane, an endless drive chain carried by sprocket gears mounted upon the frame means, a first sprocket wheel on one of said rollers for operative engagement by said chain, said first sprocket wheel having a pitch diameter equal to the diameter of the associated roller plus twice the thickness of said belt, a pair of idler sprocket wheels mounted upon said carriage assembly for

maintaining said chain in operative engagement with said first sprocket wheel, and a cylinder and piston assembly arranged for causing reciprocable movement of said carriage means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,379,824	Mummery	July 3, 1945
2,787,368	Clark et al.	Apr. 2, 1957
2,834,484	Vaney et al.	May 13, 1958