8-11-1981

Fingerling shear

Tauno B. Kilpela

Bruce A. Haataja

United States Patent [19]

Kilpela et al.

[11] **4,282,910**

[45] **Aug. 11, 1981**

[54] **FINGERLING SHEAR**

[75] Inventors: **Tauno B. Kilpela,** Atlantic Mine; **Bruce A. Haataja,** Lake Linden, both of Mich.

[73] Assignee: **Michigan Technological University,** Houghton, Mich.

[21] Appl. No.: **168,366**

[22] Filed: **Jul. 10, 1980**

[51] **Int. Cl.**[3] **B27L 7/00**

[52] **U.S. Cl.** ..... **144/3 K;** 83/666; 83/672; 144/176; 144/188; 144/193 R; 144/323; 144/34 E

[58] **Field of Search** ..... 241/92, 278; 144/162 R, 144/176, 3 R, 193 R, 193 D, 323, 326 R, 3 K, 34 R, 34 E, 185, 188; 83/333–336, 391, 394

[56] **References Cited**

U.S. PATENT DOCUMENTS

1,604,158	10/1926	Finsterwald	144/188
1,895,048	1/1933	Rose	83/666
2,663,506	12/1953	Vaughan	144/176
3,392,763	7/1968	Ledergerber	144/176
3,918,476	11/1975	Jasinski	144/34 E
3,969,966	7/1976	Dillon	83/672
4,053,004	10/1977	Barwise et al.	144/162 R

FOREIGN PATENT DOCUMENTS

680689	8/1979	U.S.S.R.	144/3 K

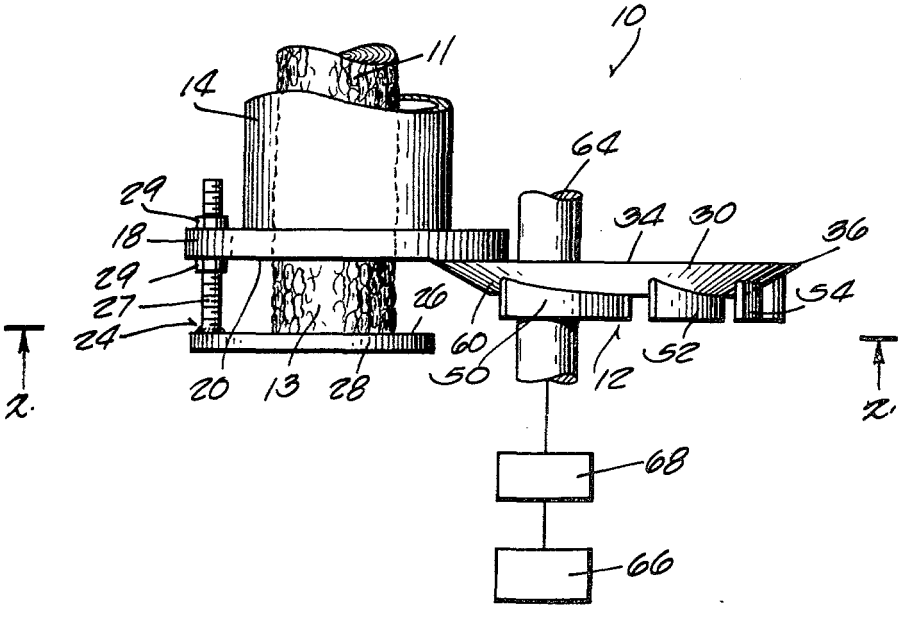
Primary Examiner—W. D. Bray

Attorney, Agent, or Firm—Michael, Best & Friedrich

[57] **ABSTRACT**

A fingerling shear for shearing a length of wood in a plane transverse to the grain direction and for splitting the sheared length along the grain direction to form a plurality of fingerlings. The shear includes a planar shearing blade, supported for rotation about a generally vertical axis, the planar shearing blade including an involute cutting edge adapted to engage the elongated piece of wood during rotation of the blade and for shearing off a length of that piece of wood, and a plurality of splitting blades fixed to the lower surface of the planar shearing blade and spaced along the involute cutting edge, the splitting blades each including a leading cutting edge spaced from the involute cutting edge of the planar blade and extending tranversely to the lower surface, the cutting edges of the splitting blades being adapted to sequentially engage portions of the sheared length of the wood stock to sequentially split fingerlings from the sheared length.

7 Claims, 2 Drawing Figures



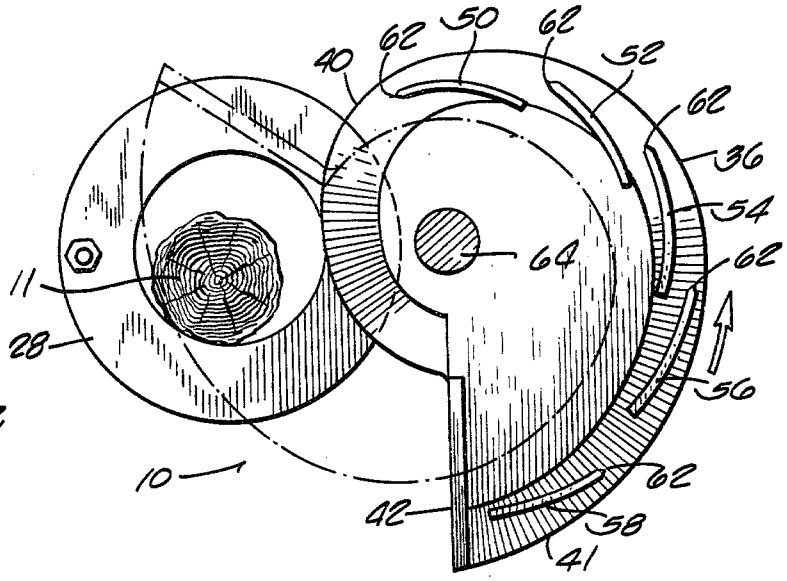

40
62
50
62
52
62
36
54
62
64
11
28
56
10
62
42
58
41

Fig. 2.

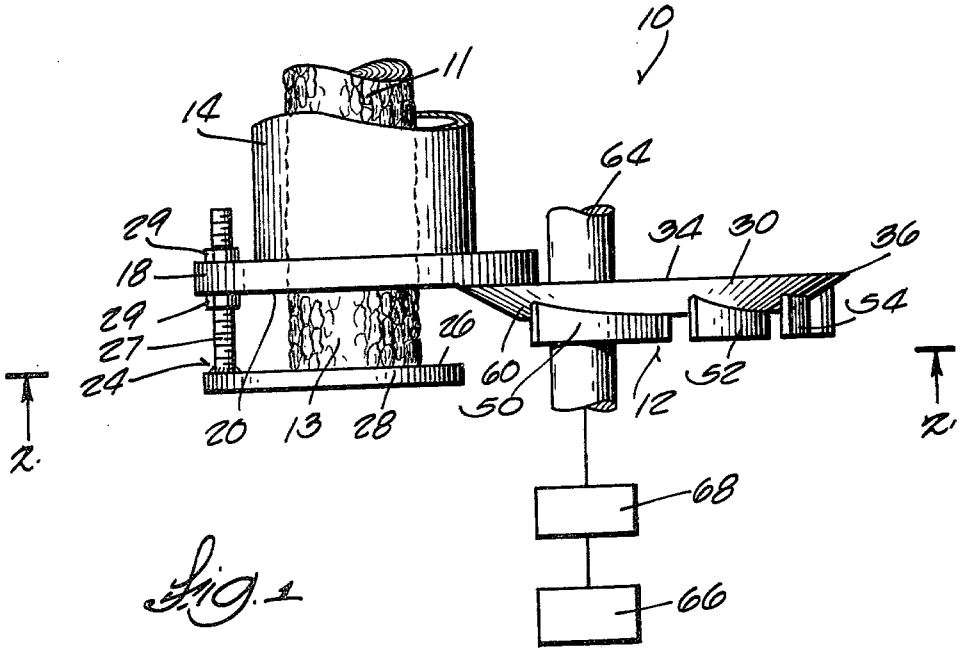

10
11
14
64
29
34
30
36
18
54
29
27
26
24
60
52
2
50
12
2
20
13
28
68
66

Fig. 1

FINGERLING SHEAR

FIELD OF THE INVENTION

The invention relates to apparatus for use in reducing otherwise waste wood products to a usable form, and more particularly comprises a fingerling shear for use in severing wood pieces such as stems and branches into relatively short lengths while splitting those short lengths into a plurality of fingerlings.

BACKGROUND PRIOR ART

Attention is directed to the Barwise, et al. U.S. Pat. No. 4,053,004, issued October 11, 1977; the Vaughan U.S. Pat. No. 2,663,506, issued Dec. 22, 1953; and the Finsterwald, U.S. Pat. No. 1,604,158, issued Oct. 26, 1926.

Attention if further directed to the Jasinski, U.S. Pat. No. 3,918,476, issued Nov. 11, 1975; and the Ledergerber U.S. Pat. No. 3,392,763.

SUMMARY OF THE INVENTION

The invention includes a fingerling shear which generally includes means for supporting an elongated piece of wood and means for shearing a length of the elongated wood in a plane transverse to the grain direction and for splitting the sheared length along the grain direction to form a plurality of fingerlings. The shearing means comprises a planar shearing blade supported for rotation about a generally vertical axis and having an involute cutting edge adapted to engage the elongated piece of wood during rotation of the blade and for shearing off short lengths of that piece of wood. A plurality of splitting blades are fixed to the lower surface of the planar shearing blade and are spaced along the involute cutting edge. The splitting blades each include a leading cutting edge spaced from the involute cutting edge of the planar blade and extending transversely to the lower surface, the cutting edges of the splitting blades being adapted to sequentially engage portions of the sheared length to sequentially split fingerlings from the sheared length.

The means for supporting and feeding the wood toward the involute blade comprises an elongated tube for housing lengths of wood and for slideably feeding the wood in the grain direction toward the cutting blade.

Various other features and advantages of the invention are set forth in the following description, in the claims and in the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an elevation view of a portion of a fingerling shear embodying the invention.

FIG. **2** is a view taken along line **2—2** in FIG. **1**.

Before explaining one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out various ways. Also, it should be understood that the phraseology and terminology employed herein is for the purpose of description and should not be regarded as limiting.

DESCRIPTION OF A PREFERRED EMBODIMENT

Illustrated in FIG. **1** is a shearing mechanism **10** for use in shearing relatively short segments of tree stems, branches, slabs or edgings **11** and for splitting the cut segments along their grain to produce fingerlings having sizes acceptable for use in a flaking machine.

The shearing mechanism **10** includes a means for supporting the stems, branches or the like **11** such that they can be fed linearly, i.e. in the direction of their grain, toward a position wherein a short end portion **13** thereof can be sheared by a shearing blade **12**. While various arrangements can be provided, in the illustrated construction, the means for supporting the stems **11** includes a stock tube **14** mounted vertically in such a manner that the stems **11** can be gravity fed through the tube **14** toward the shearing blade **12**. The lower end of the stock tube **14** includes an outwardly extending peripheral flange **18** providing a planar end surface **20**. In the illustrated construction, the stock tube **14** has an inside diameter capable of receiving branches, stems and the like **11** up to 6 inches in diameter. As will be readily appreciated, the stock tube **14** could also be of other convenient sizes.

Means are also provided for regulating the length of the sections **13** of the stems **11** to be cut off, for thereby controlling the lengths of the resultant fingerlings. While various constructions can be provided, in the illustrated arrangement, the means for regulating the lengths of the stem sections **13** to be formed, includes a length stop **24** comprising a stop plate **28** supported parallel to the lower surface **20** of the peripheral flange **18** and including an upper surface **26** adapted to support the lower end the stem **11** being fed through the stock tube **14**.

Means are also provided for supporting the stop plate **28** for adjustable movement toward and away from the end of the stock tube **14**. In the illustrated construction, such means comprises a bolt **27** welded to the stop plate **28**. The bolt **27** extends through a bore in the flange **18** and is supported by a pair of nuts **29**. While the stop plage **28** is illustrated as being positioned so as to yield sections **13** of approximately 3 inches, the position of the stop plate **28** is adjustable to facilitate cutting of fingerlings from 1 to 6 inches in length.

The means **12** for sheering off the stem portions **13** projecting from the stock tube **14** includes an involute knife **30** supported for rotation about an axis **32** parallel to and spaced from the longitudinal axis of the stock tube **14**. The involute knife **30** includes an upper planar surface **34** positioned so as to be generally slidable against the planar lower surface **20** of the peripheral flange **18**. As shown in FIG. **2**, the peripheral cutting edge **36** of the knife generally forms an involute curve, and the knife **30** is adapted to rotate in a counterclockwise direction as viewed in FIG. **2** about the axis **32**. Stated alternatively, the involute knife **30** comprises an eccentric blade, the cutting edge **36** of the blade having a radius of curvature which increases in the rotational direction opposite to the direction of rotation of the blade, whereby upon rotation of the blade, once the cutting edge **36** of the blade engages the stem, as the blade **30** continues to rotate, the cutting edge **36** will cut increasingly deeper through the stem **11** until it severs the stem. As shown in FIG. **2**, the cutting edge **36** of the blade **30** includes a leading edge portion **40** or small radius portion having a radius equal to the distance

between the axis of rotation **32** of the blade and the adjacent inside surface portion of the stock tube **14**. When the knife **30** is in the position as shown in FIG. **2**, it will be noted that the stem **16** can freely pass through the stock tube **14** since the knife blade **30** does not obstruct the open end of the stock tube. It will also be noted that the radius of curvature of the cutting edge **36** of the blade **30** increases in the direction opposite to the direction of rotation of the blade such that the trailing edge **41** of the blade **30** has a radius of curvature approximating the distance between the axis of rotation **32** of the blade and the opposite side of the stock tube **14**. The trailing edge of the knife is truncated to form a linear radially extending rearward edge **42**.

The involute knife blade **30** also includes means for splitting the severed segment **13** along its grain as it is being sheared, to thereby form a plurality of fingerlings having a length equal to that of the segment **22** being cut but having a cross sectional size which is reduced and more readily adapted to be fed into a flaker or the like. The means for splitting the severed segments comprises a plurality of splitting blades **50, 52, 54, 56** and **58** fixedly joined to the lower planar surface **60** of the involute knife **30**. In the illustrated construction, the splitting blades **50–58** each include a relatively narrow leading cutting edge **62** extending perpendicularly to the surface **60** of the involute knife and spaced radially inwardly from the cutting edge **36** of the involute knife. The splitting blades **50–58** also include an elongated trailing portion being fixedly joined to the lower surface **60** of the involute knife **30** and being curved about the axis of rotation **32** of the knife, the curved trailing portion including a concave surface facing the axis of rotation. The splitting blades **50–58** are disposed in mutually spaced staggered relationship sequentially along the periphery of the cutting edge **36** of the involute knife, and the leading or cutting edges **62** of the splitting knives are disposed at a generally uniformly spaced distance from the cutting edge **36**, and the trailing edges of the splitting knives are fixed at a greater distance from the cutting edge of the involute knife.

In operation of the fingerling shear **10** of the invention, a stem or branch **11** is fed down the stock tube **14** so as to rest on the stop plate **28** such that a length or section **13** of the stem, having a length of approximately 3 inches, will project from the lower surface **20** of the peripheral flange **18** of the stock tube. The involute knife **30** rotates about the axis **32** of the shaft **64** in a counterclockwise direction as viewed in FIG. **2**. As the knife **30** rotates about its axis, the involute cutting edge **36** will engage the stem **11** and begin to shear the stem in a direction perpendicular to the grain of the stem and adjacent to the lower surface **20** of the peripheral flange **18** of the stock tube **14**. As the cutting edge begins to cut through the stem **11**, the leading or cutting edge **62** of one of the fingerling splitters **50–58** will then engage the surface of the stem **11**, splitting the wood of the stem **11** along its grain. As the involute knife **30** continues to cut deeper through the stem **11** to shear the wood, the remaining fingerlings splitters **50–58** sequentially engage the stem and split additional fingerlings away from the stem. As the involute knife **30** cuts through the stem and continues to rotate about its axis **32**, the trailing edge **42** of the involute knife will move past the stock tube **14** thereby permitting an additional length of stem **11** to be gravity fed through the stock tube **14** until the severed end engages the stop plate **28** whereupon the involute knife **30** will severe another length of the stem **11** while the fingerling splitters **50–58** split that severed portion along the grain into a plurality of fingerlings.

While various means can be provided to drive the involute knife, in one construction, that means can comprise a motor **66** which can be a five horsepower, 1750 rpm motor coupled to the knife drive shaft **64** through suitable gearing **68** such that the knife **30** rotates at 15 revolutions per minute.

Various features of the invention are set forth in the following claims.

We claim:

1. A fingerling shear comprising means for supporting an elongated piece of wood having a grain direction, means for shearing a length of the elongated wood in a plane transverse to the grain direction and for splitting the sheared length along the grain direction to form a plurality of fingerlings, said shearing means comprising a planar shearing blade, said blade being supported for rotation about an axis, the planar shearing blade including opposed surfaces and a peripheral involute cutting edge adapted to engage the elongated piece of wood during rotation of the planar shearing blade and for shearing off a length of that piece of wood, and a plurality of splitting blades fixed to one of said surfaces of the planar shearing blade and spaced along the involute cutting edge, the splitting blades each including a leading cutting edge spaced from said involute cutting edge and extending tranversely to said one surface, said cutting edges of said splitting blades being adapted to sequentially engage portions of the sheared length of the wood stock to sequentially split fingerlings from said sheared length.

2. A fingerling shear as set forth in claim **1** wherein the means for shearing includes means for rotating said planar shearing blade about the axis of rotation.

3. A fingerling shear as set forth in claim **1** wherein the splitting blades each include an elongated blade member having a leading edge comprising said cutting edge, opposite lateral edges and a trailing edge with respect to the direction of rotation of the planar shearing blade, one of the lateral edges being fixed to said surface of the planar shearing blade.

4. A fingerling shear as set forth in claim **3** wherein said lateral edges of the splitting blades are curved about the axis of rotation of the planar shearing blade.

5. A fingerling shear as set forth in claim **3** wherein the leading edges of the splitting blades are adjacent said involute cutting edge but spaced a first distance therefrom, and wherein the trailing edges of the splitting blades are spaced from the involute cutting edge by a distance greater than the first distance.

6. A fingerling shear as set forth in claim **1** wherein the means for supporting the elongated piece of wood comprises an elongated tube for housing the elongated piece of wood and for slideably feeding the elongated piece of wood in the grain direction toward the planar shearing blade, wherein said stock tube includes a planar end surface, and wherein the other of the planar surfaces of the planar shearing blade can be slideable against said planar end surface.

7. A fingerling shear comprising means for supporting an elongated piece of wood having a grain direction, means for shearing a length of the elongated wood piece in a plane transverse to the grain direction and for splitting the sheared length along the grain direction to form a plurality of fingerlings, said shearing means comprising a planar shearing blade, said blade being supported for rotation about a generally vertical axis, the

planar shearing blade including an upper surface, a lower surface, and a peripheral involute cutting edge adapted to engage the elongated piece of wood during rotation of the blade and for shearing off a length of that piece of wood, and a plurality of splitting blades fixed to the lower surface of the planar shearing blade and spaced along the involute cutting edge, the splitting blades each including a leading cutting edge spaced from the involute cutting edge of the planar blade and extending transversely to the lower surface, said cutting edges of said splitting blades being adapted to sequentially engaged portions of the sheared length of the wood stock to sequentially split fingerlings from said sheared length, said splitting blades each including an elongated blade member having a leading edge comprising said cutting edge, said cutting edge facing the direction of rotation of said planar blade, opposite lateral edges and a trailing edge with respect to the direction of rotation of the planar cutting blade, one of the lateral edges being fixed to the lower surface of the planar blade, and the means for supporting the elongated piece of wood including an elongated generally vertical tube for housing the elongated piece of wood and for slideably feeding the elongated piece of wood in the grain direction toward the planar cutting blade.

* * * * *