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Sahlem

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(54) **LOG SPLITTER**

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(52) **U.S. Cl.** **144/195.7**; 29/275; 144/195.1; 144/195.8; 144/366; 254/104; 227/10
(58) **Field of Search** 144/193.1, 195.5, 144/195.1, 195.8, 195.7, 366; 227/8, 10; 29/275; 254/21, 104

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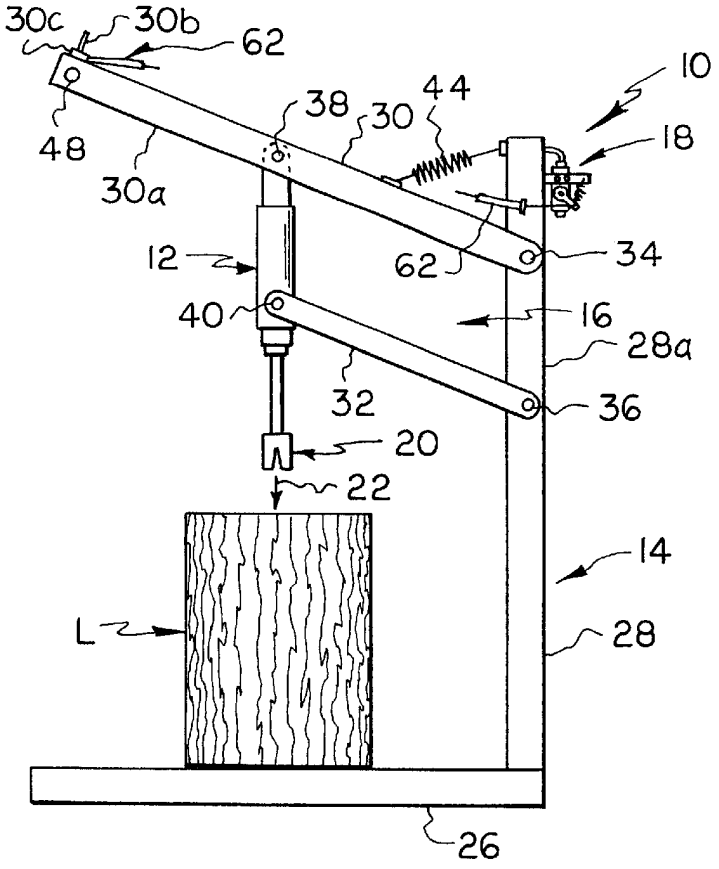
(57) **ABSTRACT**

A log splitter is disclosed as employing a fluid driven hammer adapted to impart successive log splitting movements to a log splitting element, a manually operable parallelogram linkage for supporting the hammer for vertical movement relative to an upper position for removably positioning the splitting element in engagement with a log to be split, and a control for controlling operation of the hammer.

16 Claims, 3 Drawing Sheets



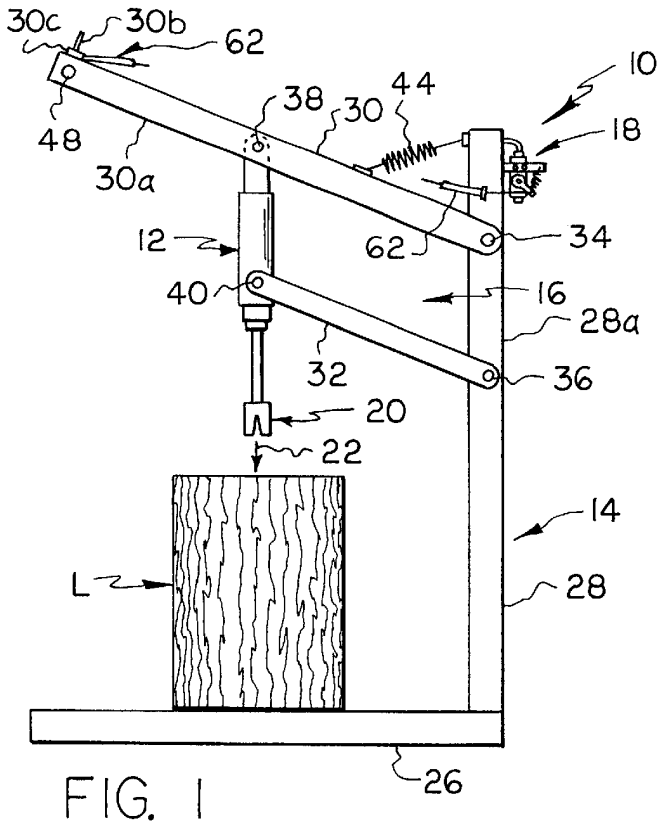


FIG. 1

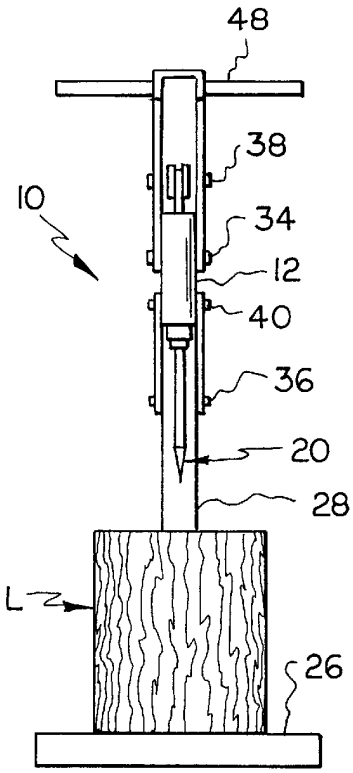


FIG. 2

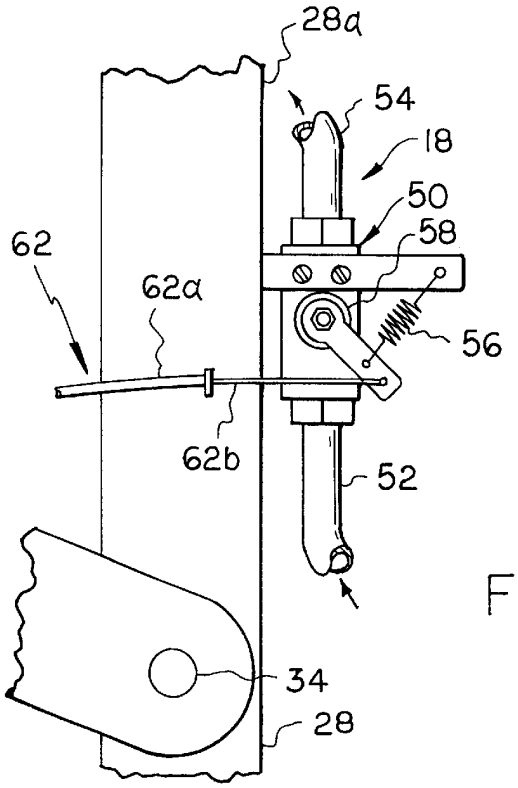


FIG. 3

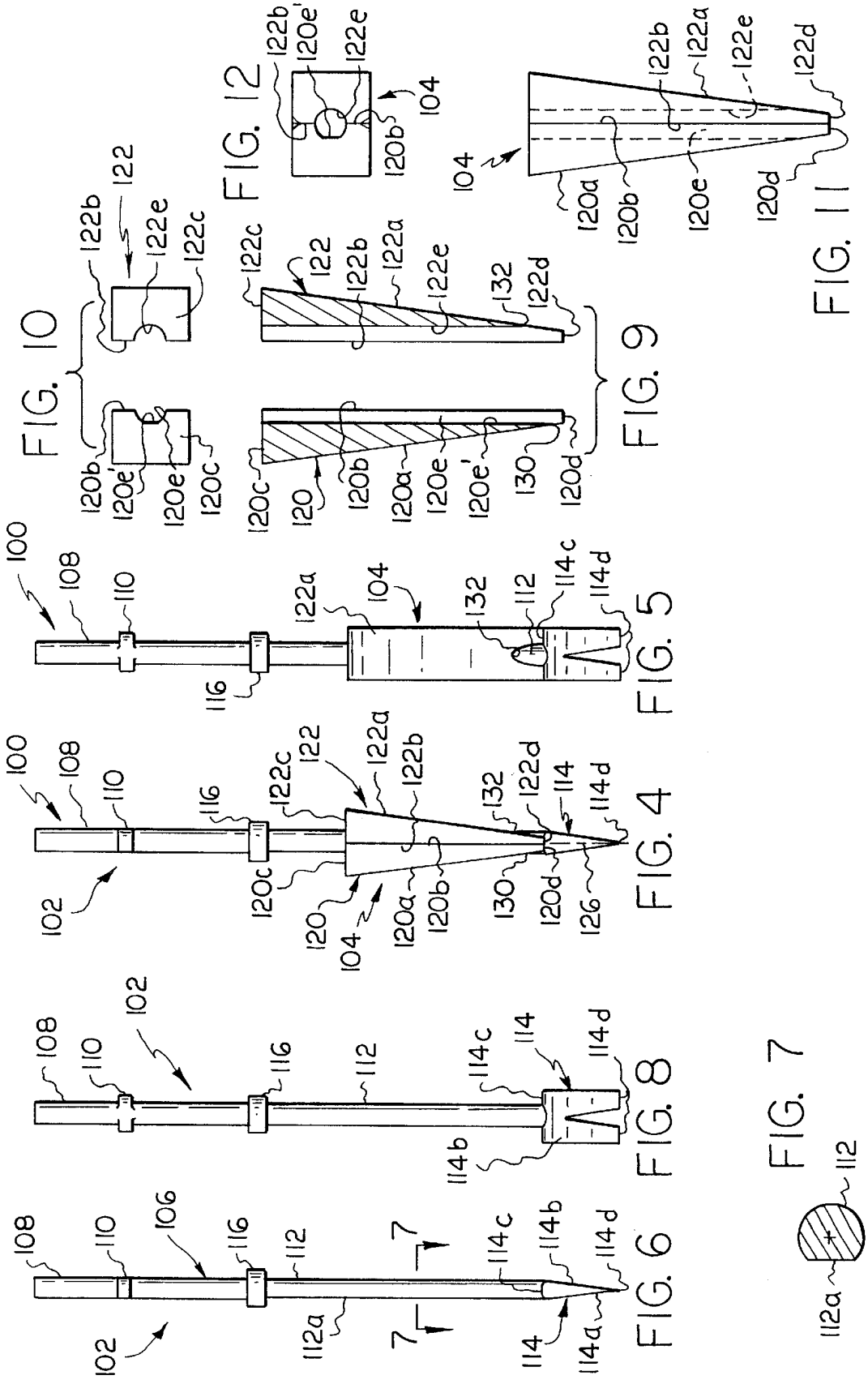


FIG. 10
122b
122
122e
122c
120b
120e'
120e
120c
FIG. 12
122b
120e'
122e
104
120b
FIG. 9
122c
122
122b
122a
122e
132
122d
120c
120
120b
120a
120e
120e'
130
120d
FIG. 11
104
122b
122a
122e
122d
120a
120b
120e
120d
FIG. 5
100
108
110
122a
104
132
112
114c
114d
116
FIG. 4
100
108
110
116
122c
122
122a
122b
132
122d
114
114d
102
120c
120
104
120a
120b
130
120d
126
FIG. 8
108
110
102
116
112
114c
114
114d
114b
FIG. 6
108
110
106
116
112
7
114c
114b
114d
102
112a
7
114
114a
FIG. 7
112
112a

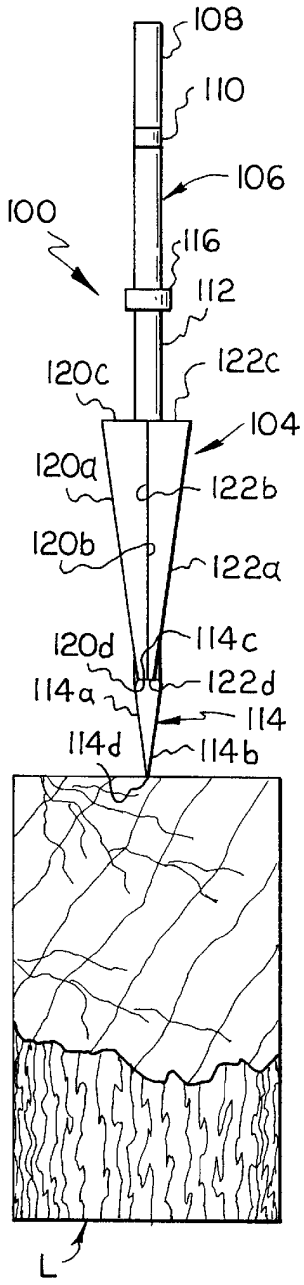


FIG. 13

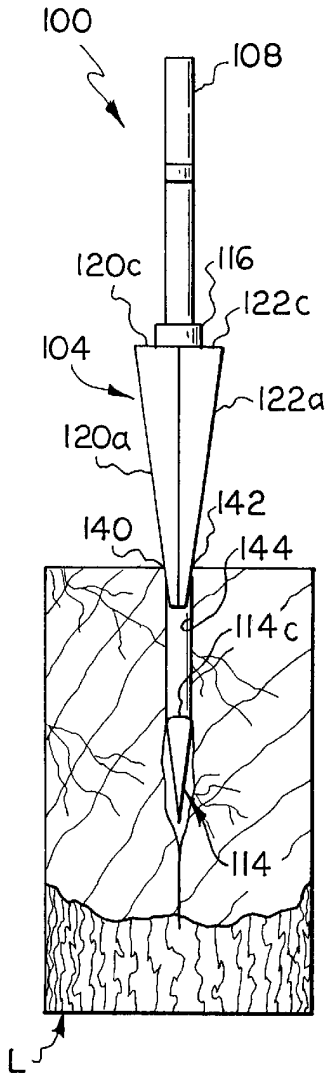


FIG. 14

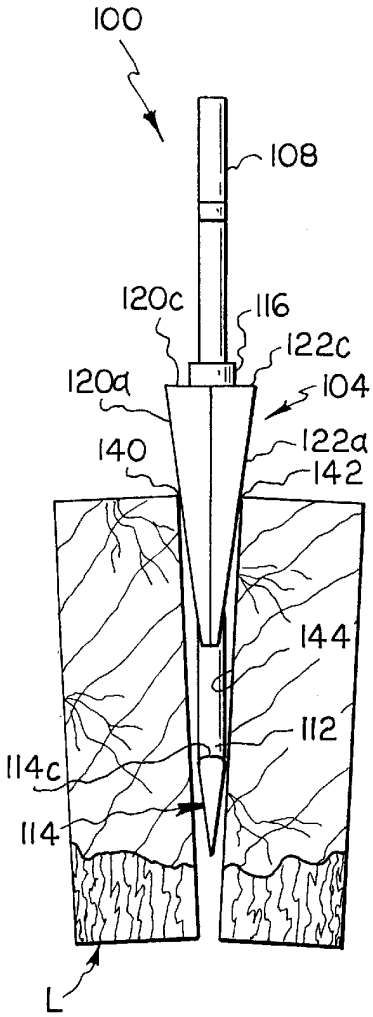


FIG. 15

LOG SPLITTER

FIELD OF THE INVENTION

The present invention relates to log splitters, and more particularly to a log splitter employing a fluid-powered hammer of known construction to split a log without requiring a user to manually manipulate and guide the hammer during use.

BACKGROUND OF THE INVENTION

Heretofore, it has been proposed in U.S. Pat. Nos. 4,669,552 and 5,107,911 to employ manually manipulate jack hammers to split logs. In each case, a user is required to lift the hammer, place the hammer in vertical alignment with a log to be split and thereafter manually support the hammer as it operates upon the log. Jack hammers used in this manner can place a substantial strain on the back of a user and can possibly result in injury to the user in the event the log to be split should tilt or slide from beneath the splitting point or wedge of the hammer at the outset of the splitting operation.

It has also been known to support a steam driven hammer on a framework for purposes of applying blows to an article supported on an anvil disposed below and in vertical alignment with the hammer. This construction is quite complicated and believed not to be readily adapted for use in the splitting of logs.

SUMMARY OF THE INVENTION

The present invention is directed to a relatively low cost and easily operated log splitter particularly adapted for use by home owner or small wood lot owner who wishes to split wood for home fireplace consumption.

BRIEF DESCRIPTION OF THE DRAWINGS

The nature and mode of operation of the present invention will now be more fully described in the following detailed description taken with the accompanying drawings wherein:

FIG. **1** is a side elevational view of a log splitter formed in accordance with the present invention;

FIG. **2** is a side elevational view, as viewed from the left of FIG. **1**;

FIG. **3** is an enlarged, partial side elevational view of the log splitter, as viewed from the right of FIG. **1**;

FIG. **4** is a side elevational view of a two-stage splitting wedge assembly formed in accordance with an alternative form of the present invention;

FIG. **5** is a side elevational view thereof, as viewed from the right of FIG. **4**;

FIG. **6** is a side elevational view of a chisel portion of the wedge assembly of FIG. **4**;

FIG. **7** is a sectional view taken generally along the line **7**—**7** in FIG. **6**;

FIG. **8** is a side elevational view of the chisel portion of the wedge assembly, as viewed from the right of FIG. **6**;

FIG. **9** is an exploded vertical sectional view of a wedge portion of the wedge assembly of FIG. **4**;

FIG. **10** is an exploded top plan view of the wedge portion;

FIG. **11** is a side elevational view of the wedge position in assembled condition;

FIG. **12** is a top plan view of the wedge portion of FIG. **10**;

FIG. **13** is a side elevational view of the wedge assembly arranged in contact with a log to be split;

FIG. **14** is a view similar to FIG. **13**, but showing the wedge assembly upon completion of initial penetration of a log by the chisel portion of the assembly; and

FIG. **15** is a view similar to FIGS. **13** and **14**, but showing the wedge assembly during a further penetration of a log by the wedge portion of the assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A log splitting device according to a preferred form of the present invention is generally designated as **10**, and shown as including a fluid powered impact hammer **12** supported for vertically directed movement relative to a base **14** by a linkage **16**, and a control **18** for controlling operation of the hammer. A log to be split is designated by the letter "L".

Hammer **12** is preferably a conventional pressurized air powered hammer having a log splitting element in the form of a wedge **20** to which it is adapted to impart an impact force during each operational cycle of the hammer, as indicated by arrow **22** in FIG. **1**. A hammer of this type may be supplied with air under pressure from a suitable air compressor, not shown. It is contemplated that in accordance with a preferred form of the invention, the trigger, not shown, of hammer **12** may be fixed in an on position, such that the hammer will operate through successive cycles, as long as pressurized air is supplied to the hammer, and that the flow of pressurized air to the hammer would be under the control of control **18**, which is best shown in FIG. **3**. It is, however, contemplated that other fluids, such as steam supplied by a suitable steam generator may be employed to operate hammer **12**. Moreover, it is contemplated that hammer **12** may be an electromagnetic hammer or a hammer powered by gases generated by burning of a combustible mixture within a cylinder forming an integral part of the hammer. In this latter case, control **18** could be arranged to permit its operation of a trigger mechanism of the hammer.

Base **14** preferably includes a ground or otherwise supported support plate **26** and a post **28** arranged to vertically upstand from the support plate. Alternatively, post **28** may be otherwise supported, such as being fixed to any suitable vertically extending, rigid object, such as a wall, and in this case a log "L" to be split would be simply arranged to upstand from the ground.

Linkage **16** is preferably in the form of a parallelogram linkage having a pair of opposite vertically extending links, defined by hammer **12** and an upper end portion **28***a* of post **28**, a pair of vertically spaced links defined by an elongated upper link **30** and a lower link **32**. Post end portion **28***a* is pivotally coupled to first ends of upper link **30** and lower link **32** by a first pair of upper and lower pivot pins **34** and **36**, respectively, and hammer **12** is pivotally coupled to a mid-portion of upper link and a second end of lower link **32** by a second pair of upper and lower pivot pins **38** and **40**, respectively. Pivot pins **34**, **36**, **38** and **40** have parallel pivot axes, and the transverse spacing between pivot pins **34** and **36** is preferably equal to the transverse spacing between pivot pins **38** and **40**, and the transverse spacing between pivot pins **38** and **34** is preferably equal to the transverse spacing between pivot pins **40** and **36**. Alternatively, a separate vertically extending link, not shown, may be pivotally connected to links **30** and **32** by pivot pins **38** and **40**, and hammer **12** suitably fixed to such separate link.

By use of a parallelogram linkage, hammer **12** is constrained to be maintained in constant vertical orientation,

e.g. parallel to post **28**, during vertical movements of the hammer downwardly from and during return to an inoperative or upper position shown in FIGS. **1** and **2**. The inoperative upper position of hammer **12** may be variously defined, such as by providing post **28** with an abutment, not shown, arranged for engagement by upper link **30**, and a spring **44** shown only in FIG. **1**, employed to normally bias the hammer to normally assume its inoperative position.

Preferably, the free swinging end **30***a* of upper link **30** is provided with a transversely extending handle **48**, which can be gripped by the hand of an operator whenever he wishes to initiate movement of hammer **12** downwardly away from its inoperative position.

Control **18** is best shown in FIG. **3** as including an air flow control valve **50** having an inlet conduit **52** connected to a source of air under pressure, not shown, and a discharge conduit **54** connected to hammer **12**. Valve **50** is normally maintained in closed or flow blocking condition by a return spring **56** acting on rotary valve part **58**, but may be moved into an open position, not shown, to place conduits **52** and **54** in flow communication for purposes of operating the hammer by operation of a control cable **62**. Cable **62** includes a sheaf **62***a* and a movable control wire **62***b*, which is slidably received within the sheaf and has its opposite ends connected to a rotatable valve part **58** and an operating lever **30***b*, which is pivotally supported by a bracket **30***c* in turn mounted on the free swinging end **30***a* of upper link **30** or on handle **48**, as desired. By pivoting lever **30***b* in a counterclockwise direction, as viewed in FIG. **1**, valve part **58** is caused to rotate in a clockwise direction, as viewed in FIG. **3**, to open valve **50** against the bias of spring **56**. If desired, lever **30***b* and bracket **30***c* may be similar in construction to a typical bicycle handle mounted brake operator. Also, it is contemplated that valve **50** may be dispensed with and lever **30***b* connected to the trigger of hammer **12** by control cable **12** or other suitable control linkage, such that a trigger operated flow control valve arranged internally of the hammer is used in place of valve **50**.

In operation of the preferred form of log splitter **10**, a log "L" is first placed on support plate **26** to upstand in vertical alignment with splitting element **20**, while hammer is maintained in its illustrated upper inoperative position by spring **44**. In this position of hammer **12**, return spring **56** is operative to maintain valve **50** in its closed condition, wherein flow of air from inlet conduit **52** to discharge conduit **54** is blocked, thereby resulting in the hammer being rendered inoperative for lack of pressurized air supplied thereto.

Thereafter, when an operator wishes to split log "L", he grasps handle **48** and pulls downwardly to place splitting element **20** in engagement with the log. At some desired position of hammer **12**, the operator pivots lever **30***b* in order to cause sliding movement of control wire **62***b* within sheaf **62***a* with the result that valve part **58** is caused to rotate sufficiently to move valve **50** into an open position, thereby placing conduits **52** and **54** in flow communication. Thus, pressurized air is supplied to hammer **12** during an operator determined portion of the downward movement of the hammer away from its illustrated inoperative position for purposes of imparting successive blows to wedge **20**, as required to effect splitting of the log, and operation of the hammer continues until the lever **30***b* is released in order to permit spring **56** to return valve **50** to its original closed condition. Spring **44** in turn returns hammer **12** to its operative position upon release of handle **48**.

A modified form of the present invention is shown in FIGS. **4–15**, wherein **100** designates a two-stage splitting wedge assembly adapted for use in splitting a log "L". Assembly **100** includes a chisel portion **102** and a wedge portion **104** slidably mounted on the chisel portion for movement between a first position shown in FIGS. **4**, **5** and **13**, and a second position shown in FIGS. **14** and **15**.

Chisel portion **102** is best shown in FIGS. **6–8** as including an elongated shank **106** having a cylindrical mounting end portion **108** provided with an oval-shaped shoulder **110**, and a generally cylindrical opposite end portion **112** mounting a fork-shaped chisel **114** having a pair of chisel side surfaces **114***a* and **114***b*, which converge downwardly from a chiseled upper edge **114***c* to define a knife edge **114***d*. Opposite end portion **112** is separated from the mounting end portion by a round shoulder or abutment **116**. As best shown in FIGS. **6** and **7**, opposite end portion **112** is provided with a flat surface **112***a* extending downwardly between shoulder **116** and chisel **114**. It will be understood that end portion **108** and oval-shaped shoulder **110** may be employed to removably mount assembly **100** on hammer **12**, as is known in the art relating to fluid-powered hammers.

Wedge portion **104** is best shown in FIGS. **9–12** as being of a two-part construction consisting of first and second wedge halves **120** and **122** formed with planar, oppositely-facing and downwardly convergent wedge surfaces **120***a* and **122***a*; planar, facing surfaces **120***b* and **122***b*; coplanar upper end abutment surfaces **120***c* and **122***c*; and coplanar lower end abutment surfaces **120***d* and **122***d*. Facing guide recesses **120***e* and **122***e* are arranged to open through facing surfaces **120***b* and **122***b*, respectively, and are shaped and sized to slidably engage with opposite end portion **112** for purposes of mounting wedge portion **104** for sliding movements between its first and second positions. It will be noted by viewing FIGS. **10** and **12** that recess **120***e* is formed with a lengthwise extending flat surface **120***e'*, which is arranged to slidably engage with flat surface **112***a* in order to constrain wedge portion **104** from rotation about the axis of shank end portion **112** away from its position or orientation shown in FIG. **4**, wherein facing surfaces **120***b* and **122***b* are disposed parallel to a bisection plane **126** extending vertically through the chisel cutting edge **114***d*. It will also be noted that guide recesses **120***e* and **122***e* are of sufficient depth, such that they cooperate with wedge surfaces **120***a* and **122***a* to define wedge surface cut outs **130** and **132**, which extend upwardly from lower abutment surfaces **120***d* and **122***d*, as best shown in FIGS. **4**, **5** and **9**. Preferably, the widths of wedge halves **120** and **122** correspond to the width of chisel **114**, as shown in FIG. **5**, and the sum of the thicknesses of lower end abutment surfaces **120***d* and **122***d* is less than the maximum thickness of the upper edge **114***c* of chisel **114**, as shown in FIG. **4**.

After forming wedge halves **120** and **122** as separate parts, as shown in FIGS. **9** and **10**, the halves are placed about end portion **112** and thereafter joined, as in welding, to form an unitary structure arranged to surround shank end portion **112** intermediate chisel **114** and shoulder **116**.

In use of a log splitter fitted with assembly **100**, the assembly is first mounted on hammer **12** and a log "L" then placed on support plate **26** to upstand in vertical alignment with chisel **114**, while the hammer is maintained in its upper inoperative position. Thereafter, an operator grasps handle **48** and pulls downwardly thereon to place chisel **114** in engagement with the previously positioned log "L", as shown in FIG. **13**. Upon placement of chisel **114** in engagement with log "L", or if desired, as an incident to downward movement of hammer **12**, lever **30***b* is operated to open valve **50** and supply pressurized air or other fluid to the hammer. Up to this point, wedge portion **104** rests in its

lower or first position under the influence of gravity, wherein lower abutment surfaces **120***d* and **122***d* rest on or abut against the chisel upper edge surface **114***c,* as shown in FIG. **13**. Operation of hammer **12** with chisel **114** engaged with log "L" serves to drive the chisel downwardly into the log to first place those portions of wedge surfaces **120***a* and **122***a,* which are disposed adjacent the upper ends of wedge surface cutouts **130** and **132**, in engagement with adjacent edges **140** and **142** of the log "L", which bound the split or opening **144** created in the log by chisel **114**. Thereafter, wedge portion **104** is forced to slide upwardly relative shank lower portion **112** until upper abutment surfaces **120***c* and **122***c* move into engagement with enlargement **116** to complete a first stage of a log splitting operation as shown in FIG. **14**.

Upon continued operation of hammer **12**, wedge portion **104** is forced by enlargement **116** to move further downwardly into split **144**, whereupon wedge surfaces **120***a* and **122***a* serve to progressively enlarge or increase the width of the split until a second stage of the log splitting operation is completed with the final separation of the log into lengthwise extending pieces, as shown in FIG. **15**.

Various further modifications in the construction of the present log splitter are contemplated without departing from the present invention. In this respect, the length of post **28** may be made adjustable, as desired to compensate for varying lengths of logs to be split, and the upper and lower links of linkage **16** may be reversed, if desired to increase the stability of the log splitter. Further, in that wedge **20** follows an arculate path when hammer **12** is supported by a parallelogram, it may be desirable, particularly when splitting longer logs, to mount support plate **26** for horizontal sliding movement in order to reduce any tendency of a log to tilt, as the wedge moves downwardly through a log. Alternately, wedge may be mounted to permit horizontal sliding displacements thereof in order to prevent tilting of a log during splitting thereof. Still further, operation of hammer **12** may be automatically controlled as an incident to vertical movement of hammer **12**. In this respect, lever **30***b* and bracket **30***c* may be dispensed with and an end of control wire **62***b* connected directly to the free swinging end of the upper link **30**, such that valve **50** is forced to open incident to movement of hammer **12** downwardly away from its inoperative position and permitted to close under the influence of spring **56**, as the hammer is returned to its inoperative position by spring **44**.

What I claim is:

1. A log splitter comprising:

a fluid powered impact hammer having a log splitting element and being operable for imparting log splitting impact force to said element;

a control for controlling operation of said hammer;

a base;

a linkage for supporting said hammer on said base for vertical movement relative to a log to be split; and

a means for imparting said vertical movement to said hammer for removably placing said element in engagement with a log to be split.

2. A log splitter according to claim **1**, wherein said base includes a vertically disposed post, said linkage is a parallelogram linkage comprising a pair of opposite vertically extending links defined by said hammer and said post and a pair of vertically spaced links defined by an upper link pivotally connected to said post and an upper end portion of said hammer and a lower link pivotally connected to said post and a lower end portion of said hammer, and said upper link having a free end portion projecting away from said post beyond said pivotal connection to said hammer for defining said means for imparting said vertical movement in the form of a handle portion engageable.

3. A log splitter according to claim **2**, wherein spring means are provided to normally bias said handle portion upwardly towards an upper hammer inoperative position, and said hammer is moved vertically downwardly against said bias by a user engaging said handle portion.

4. A log splitter according to claim **3**, wherein said control includes an operator actuated means mounted for movement with said free end portion.

5. A log splitter according to claim **4**, wherein said control is a valve controlling flow of fluid to said hammer for effecting operation thereof and a valve control operating cable having a first end operably connected to said valve and a second end connected to said operator actuated means.

6. A log splitter according to claim **5**, wherein said base additionally includes a horizontally disposed support plate for supporting a log to be split, and said post upstands from said support plate.

7. A log splitter according to claim **1**, wherein spring means is provided to bias said linkage to normally maintain said hammer in an upper inoperative position, said hammer is a pressurized fluid operated hammer, said control includes a pressurized fluid control valve located remotely of said hammer and having a closed position for preventing flow of pressurized fluid to said hammer and an open position permitting flow of pressurized fluid to said hammer for imparting log splitting impact to said element, a return spring tending to bias said control valve into said closed position and a manual operator located remotely of said control valve and operably connected to said control valve by a flexible cable for moving said control valve into open position against said bias of said return spring.

8. A log splitter according to claim **7**, wherein said linkage is manually movable to move said hammer from said inoperative position against said bias of said spring means, and said linkage is a parallelogram linkage.

9. A log splitter according to claim **8**, wherein said base includes a vertically disposed post, said hammer and control valve are supported on said post, and said manual operator is supported by said linkage.

10. A log splitter according to claim **9**, wherein said base includes a horizontally disposed support plate for supporting a log to be split, and said post upstands from said support plate.

11. A log splitter according to claim **1**, wherein said element includes a chisel portion operably coupled to said hammer and a wedge portion carried by said chisel portion,

said chisel portion mounting a chisel adjacent a free end thereof, said wedge portion having wedge surfaces converging in a direction towards said chisel, characterized in that upon operation of said hammer said chisel is brought into initial engagement with a log to be split to initiate splitting of said log and said wedge surfaces are subsequently brought into engagement with said log to complete splitting of said log.

12. A log splitter according to claim **11**, wherein said chisel portion has an abutment spaced from said chisel, and said wedge portion is slidably supported on said chisel portion and has oppositely facing end surfaces adapted to alternatively engage with said chisel and said abutment to limit the extent of sliding movement of said wedge portion relative to chisel portion.

13. A log splitter according to claim 12, wherein said chisel has convergent log splitting surfaces and a maximum thickness, as measured between said splitting surfaces, which is less than the maximum thickness of said wedge portion, as measured between said wedge surfaces.

14. A log splitter comprising:

a fluid powered impact hammer having a wedge-shaped log splitting element to which said hammer imparts impact forces during operation;

a means for supporting said hammer for vertical movement downwardly from an upper inoperative position for placing said log splitting element in engagement with a log to be split and upwardly for return to said inoperative position;

a second means tending to normally maintain said hammer in said upper inoperative position, said means for supporting said hammer being operable by a user to move said log splitting element into engagement with said log to be split incident to downward movement of said hammer from said upper inoperative position;

a third means operable by said user to initiate operation of said hammer; and

a fourth means tending to terminate operation of said hammer.

15. A log splitter of claim 14, wherein said second and fourth means are spring means.

16. A log splitter of claim 14, wherein said means for supporting said hammer includes a first vertically upstanding link, an upper link, a lower link and said hammer, first and second pivot means for coupling said vertically extending link to said upper and lower links, and third and fourth pivot means for coupling said hammer to said upper and lower links, said first and second pivot means having a spacing corresponding to that of said third and fourth links, and said first and third pivot means having a spacing corresponding to that of said second and fourth pivot means to define a parallelogram linkage for supporting said hammer for vertical movement.

* * * * *