Aug. 18, 1970 L. N. SMITH 3,524,485

LOG CHIPPING APPARATUS

Filed Aug. 5, 1968

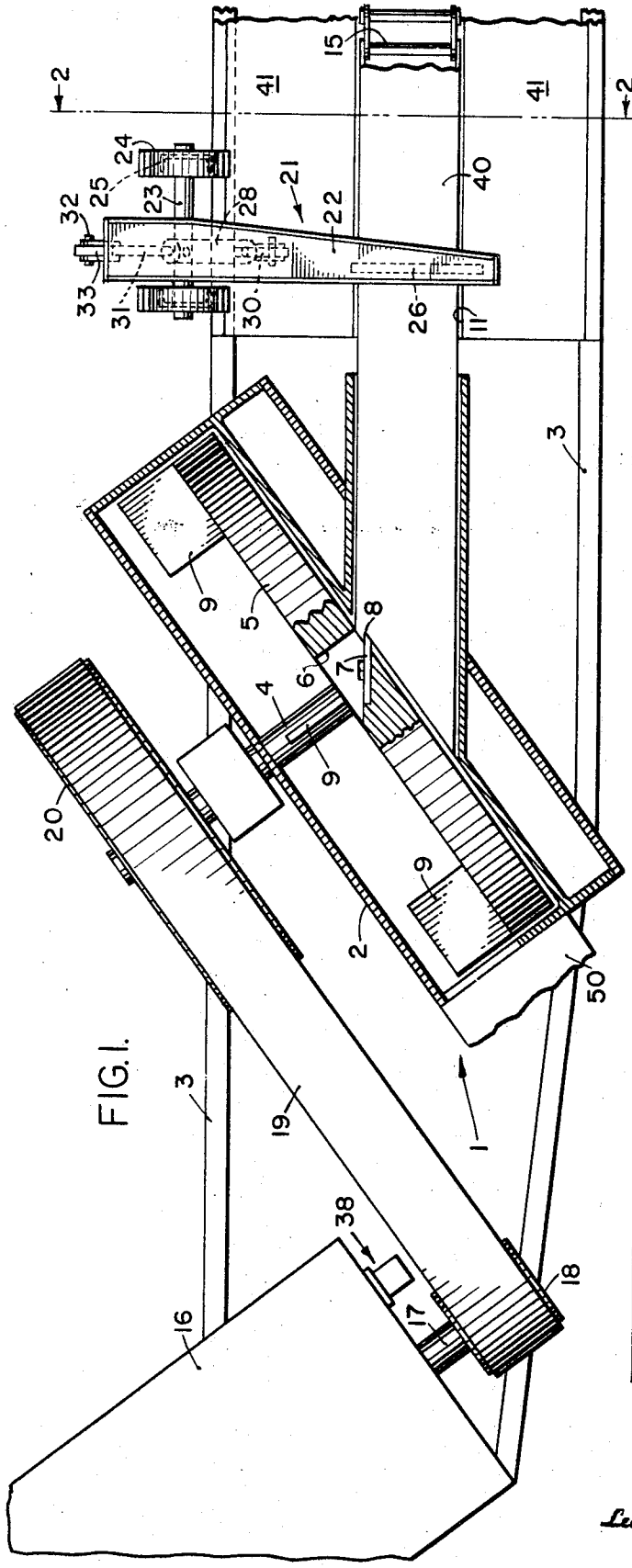


FIG. 1.

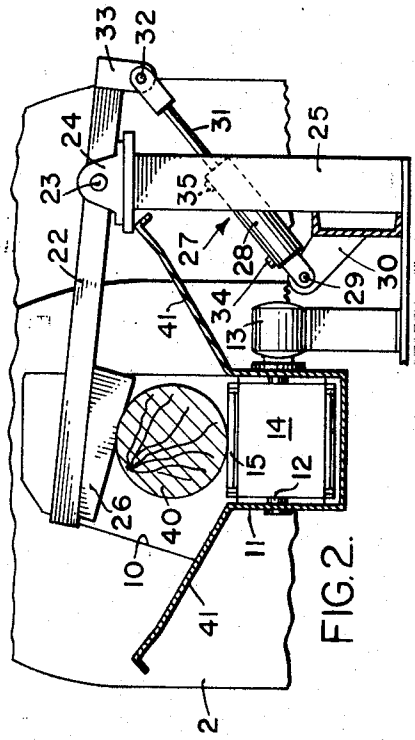


FIG. 2.

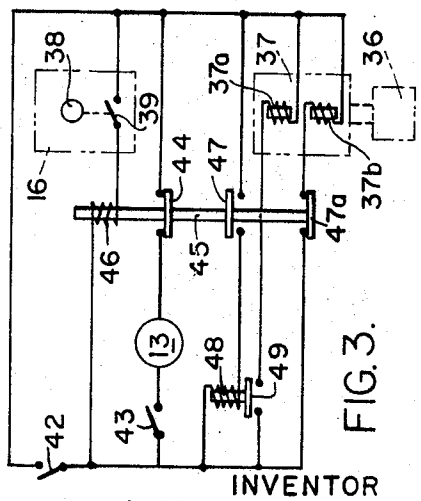


FIG. 3.

INVENTOR
LEWARD N. SMITH
BY his attorneys,
Learman, Learman & McCulloch

United States Patent Office 3,524,485 Patented Aug. 18, 1970

3,524,485

LOG CHIPPING APPARATUS

Leward N. Smith, Remus, Mich., assignor to Morbark Industries, Inc., Winn, Mich., a corporation of Michigan

Filed Aug. 5, 1968, Ser. No. 750,199
Int. Cl. B27c 1/12; B02c 18/24
U.S. Cl. 144—176 15 Claims

ABSTRACT OF THE DISCLOSURE

Log chipping apparatus comprising a rotatable chipping disk and a feed conveyor for feeding a log lengthwise into engagement with the chipper and including a speed sensing device operable to sense changes in the speed of rotation of the chipper. The speed sensing device is coupled to the feeding conveyor and includes means to enable and disable operation of the latter in accordance with changes in the speed of movement of the chipper. A stop member is coupled to the sensing device for movement into and out of holding engagement with a log in response to changes in speed of the chipper.

This invention relates to log chipping apparatus and more particularly to a portable chipping mechanism having means to control the feeding of a log to a chipping wheel so as to enable the chipping wheel to operate at speeds most desirable for the formation of chips.

In the manufacture of paper from wood pulp, trees growing in a forest are cut, debarked, and cut into chips for further processing into pulp from which paper is made. To expedite operations, it is preferable that the logs be converted into chips in the forest, thereby dispensing with the necessity of handling and shipping unwieldy logs. In the formation of the chips it is conventional to feed a log to a chipping station at which a movable, toothed member engages the log and converts the latter into chips. In the formation of the chips, however, the rate at which the chipping knives travel has a direct bearing on the quality of chips produced. That is, if the log being fed slows down the chipping apparatus beyond a predetermined speed, a change in the size of chips and the rapidity at which they are produced occurs. It is preferable that the chips to be produced for paper making be substantially of uniform size, thereby facilitating the reduction of the chips to pulp.

An object of this invention is to provide log chipping apparatus wherein the feed of the log to the chipping apparatus is automatically interrupted when necessary so as to enable the chipping apparatus to regain speed and produce chips of substantially uniform size.

Another object of the invention is to provide apparatus of the character referred to and wherein the log feed is controlled automatically in response to changes in the rate of movement of the chipping apparatus.

A further object of the invention is to provide chipping apparatus of the character described which is self contained so as to be capable of utilization at remote and isolated forest sites.

Still a further object of the invention is to design a wood harvesting system employing a chipper which in view of the provision for stopping feeding of the log into the chipper may be driven by a smaller motor of considerably decreased horsepower.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings in which:

FIG. 1 is a fragmentary view, partly in top plan and partly in section, of chipping apparatus constructed in accordance with the invention;

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1; and

FIG. 3 is a simplified schematic diagram of electrical and pressure fluid apparatus forming part of the invention.

Apparatus constructed in accordance with the invention includes conventional chipping mechanism **1** comprising a cylindrical housing **2** mounted on a suitable wheeled frame **3** and within which housing is journaled a rotary shaft **4** on which is fixed a disk **5**. At intervals around the periphery of the disk **5** are slots **6** in each of which is fixed a cutting blade or tooth **7** having a cutting edge **8** which projects beyond one face of the disk. The plane of rotation of the disk **5** constitutes a chipping station. Secured to and entering beyond the opposite face of the disk is a plurality of fan blades **9**, the purpose of which will be explained hereafter.

At one side of the housing **2** is an opening **10** which is vertically spaced from the axis of rotation of the disk **5**. Supported by the housing is a trough-like member **11** which communicates with the opening **10** and journals, adjacent the housing **2**, a shaft **12** that is driven by an electrically controlled hydraulic motor **13**. Fixed on the shaft **12** is a turning member **14** around which is trained an endless metal rod conveyor **15**. The motor drives the shaft **12** in such direction that the upper run of the conveyor moves along a path leading to the chipping disk **5**.

Means for rotating the disk **5** comprises an internal combustion engine **16** having a drive shaft **17** on which is fixed a pulley **18**. A drive belt **19** is trained around the pulley **18** and around a pulley **20** which is fixed to the shaft **4**. Operation of the motor **16** causes the shaft **4** to rotate clockwisely, as viewed in FIG. 1.

Stop means designated generally by the reference character **21** is provided forwardly or upstream of the chipping mechanism and comprises an arm **22** pivoted as at **23** between its ends on trunnions **24** supported on upright members **25**. The arm **22** is of such length that one end overhangs the path of movement of the conveyor **15** and to that end of the arm is secured a depending, sharpened blade **26**. The arm **22** is movable between raised and lowered positions by means of a double acting hydraulic ram **27** having a cylinder **28** pivoted as at **29** to a mounting bracket **30** and within which is a reciprocable piston having a piston rod **31** with a yoke pivoted as at **32** to the arm **22**. Hydraulic fluid is introduced to an exhausted from opposite ends of the cylinder **28** via ports **34** and **35** by means of an electrically operated pump **36** supplying hydraulic fluid to an electrically operated ram reversing valve **37**.

A speed sensing device **38**, such as a tachometer, is mounted on the engine **16** and is coupled to the drive shaft **17** by conventional means (not shown). Incorporated in the device **38** normally open is a switch **39** (FIG. 3) which is adapted to open and close in response to changes in speed of rotation of the drive shaft **17**. The switch **39** may be any one of a number of known speed sensitive switches. For example, a switch of the kind manufactured by Synchro-Start Products Inc. of Skokie, Ill. and disclosed in its 1961 copyrighted bulletins Nos. 604

and 605 is satisfactory. The function and operation of the apparatus 37 and 39 will be referred to subsequently.

To condition the apparatus for operation, a debarked log or bolt 40 proceeds on the conveyor 15 after discharge from a debarking machine so as to be fed lengthwise toward the chipping station. To facilitate the handling of the log 40, inclined aprons 41 are provided on opposite sides of the conveyor 15. With the log on the conveyor, the motor 13 may be started by closing a master switch 42 and a start-stop switch 43 which are in circuit with the motor 13 and with a suitable source of electrical energy such as that produced by the generator or alternator of the engine 16. Also in circuit with the motor 13 is a normally closed contact 44 of a relay 45, the coil 46 of which is in circuit with the normally open switch 39. The relay 45 has a normally open contact 47 adapted to make and break a circuit which includes a relay 48 having a normally open contact 49 in circuit with advance solenoid 37*a* of the valve 37. The valve 37 also has a retract solenoid 37*b* in a circuit line with a normally closed contact 47*a*.

When the parts are in the positions shown in FIG. 3, closing of the switches 42 and 43 will actuate the motor 13 so as to cause the conveyor 15 to feed the log 40 toward the chipping station. As the log is fed toward the chipping station its leading end will be engaged by the rotating knives 7 so as to cause chips to be cut from the log. Chips thus cut from the log will be blown by the fan blades 9 through a tangential opening in the housing 2 into a chute 50 for discharge to a suitable truck or other vehicle which can haul the chips to the mill.

The speed at which the motor 13 operates is so selected as to drive the conveyor 15 at a rate calculated to feed the log 40 to the chipping member 5 at such speed as to enable the chips cut from the log to be of substantially uniform size and without imposing undue load on the driving mechanism for the chipping member. A typical speed for the shaft 17 may be 450 r.p.m.

Due to many considerations, however, such as the varying diameters of logs from one end to another, or of different logs, it is inevitable that the speed of rotation of the chipping member 5 will vary. As the chipping disk decelerates, it becomes increasingly difficult for the blades 8 to remove chips from the leading end of the log and this difficulty is compounded by the necessity of such chips being sufficiently large to keep pace with the rate of feed of the log. Thus, it is possible for the chipping disk to become stalled at times with larger diameter logs.

According to the present invention, the tachometer 38 functions to indicate the speed of the engine drive shaft 17, which speed is directly related to the speed of rotation of the shaft 4. When the speed of rotation of the chipper disk 5 decreases, the speed of rotation of the motor 17 also will decrease and the decrease in speed will be indicated by the tachometer 38. When the speed of the motor shaft 17 reaches a predetermined rate, as indicated by the tachometer, such as a rate corresponding to 350 r.p.m. of shaft 4, the tachometer will close the switch 39, thereupon energizing the relay 45 and effecting opening of the contact 44 and closing of the contact 47. Opening of the contact 44 will interrupt operation of the motor 13, thereby discontinuing the feeding of the log to the chipping station. Closing of the contact 47 will energize the relay 48 so as to close the contact 49, whereupon the solenoid 37*a* will be energized and the valve 37 will be adjusted so as to permit an extension of the hydraulic ram 27 to cause movement of the arm 22 counterclockwise, as viewed in FIG. 2, until the blade 26 moves into the path of movement of the log 40 and penetrates the latter to hold the log firmly against movement either toward or away from the chipping wheel 5. In this position of blade 26 the conveyor 15 is also hydraulically locked and cannot move until the normal speed of shaft 17 is regained.

When movement of the log toward the chipping station is restrained, the resistance to rotation of the chipping disk 5 is diminished, thereby enabling the disk 5 to accelerate. When the speed of the shaft 17 accelerates to a predetermined rate, as indicated by the tachometer 38, the switch 39 opens and deenergizes the relay 45, thereby effecting closing of the switch 44, opening of the contact 47, and closing of contact 47*a*. The motor 13 thereupon will be reenergized and the valve 37 will be reversed so as to contact the ram 27, thereby restoring the stop blade 26 to a position clear of the path of the log 40. Feeding of the log to the chipping station thereupon recommences.

The foregoing operation may be repeated several times during the chipping of a single log.

This disclosure is representative of a presently preferred form of the invention but is intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

What is claimed is:

1. Log chipping apparatus comprising: movable chipping means; means for moving said chipping means at a chipping station in a path of chipping travel at a predetermined rate of movement; means for feeding a log along a path toward said chipping station into engagement with said chipping means; means responsive to changes in the rate of movement of said chipping means for halting said log including log stopping means and means mounting said log stopping means for movement into and out of the path of movement of said log; and means responsive to changes in the rate of movement of said chipping means for effecting movements of said stopping means.

2. Apparatus as set forth in claim 1 wherein said chipping means comprises a rotatable vertically disposed disk member having cutting blades thereon.

3. Apparatus as set forth in claim 2 wherein said disk member has fan blades thereon.

4. Log chipping apparatus comprising: movable chipping means; means for moving said chipping means at a chipping station in a chipping path of travel; means for feeding a log along a path toward said chipping station into engagement with said chipping means; stop means; means mounting said stop means for movement from a first removed position to a second position in the path of said log for engagement therewith to interrupt movement thereof said station; and operating means for moving said stop means between said first and second positions.

5. Apparatus as set forth in claim 4 including sensing means operable to detect changes in the speed of movement of said chipping means, and wherein said operating means includes means responsive to operation of said sensing means for moving said stop means from one of said positions to the other.

6. Apparatus as set forth in claim 4 wherein said operating means comprises pressure fluid means.

7. Apparatus as set forth in claim 4 wherein said chipping means comprises a rotatable disk having chipping teeth thereon.

8. Apparatus as set forth in claim 7 including a housing surrounding said disk and having an opening therein to receive said log.

9. Apparatus as set forth in claim 8 wherein said housing has a second opening therein and wherein said disk has fan blades thereon arranged to discharge chips from said housing through said second opening.

10. Apparatus as set forth in claim 4 including means for driving said feeding means; and means for starting and stopping said driving means.

11. Apparatus as set forth in claim 10 including sensing means operable to detect changes in the speed of movement of said chipping means; and means coupling said sensing means to said driving means for operating the latter in accordance with speed changes of said chipping means.

12. Apparatus set forth in claim 4 wherein said stop means comprises a blade having a sharpened edge adapted to be driven into penetrating engagement with said log.

13. Log chipping apparatus including: chipping means; means for moving said chipping means at a chipping station in a path of chipping travel at a predetermined rate of movement; means for feeding a log along a path toward said chipping station into engagement with said chipping means; and means responsive to a decrease in the rate of movement of said chipping means for halting the travel of said log until said chipping means regains a predetermined rate of movement.

14. Apparatus as set forth in claim 13 wherein said means for substantially halting the travel of said log comprises means for starting and stopping said feeding means.

15. Apparatus as set forth in claim 13 wherein said halting means comprises means for sensing the rate of movement of said chipping means; stop blade means; means mounting said stop blade means for movement into and out of the path of movement of said log; and

operating means responsive to said sensing means for moving said stop blade means.

References Cited

UNITED STATES PATENTS

1,962,778	6/1934	Kranick	241—35
2,556,653	6/1951	Kelso	241—35
2,838,080	6/1958	Springate	144—162 X
3,199,793	8/1965	Sabi	241—34
3,332,461	7/1967	Ledergerber	144—176

GIL WEIDENFELD, Primary Examiner

U.S. Cl. X. R.

83—58; 144—242; 241—35