United States Patent [19]

Lunn

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[45] **Feb. 18, 1975**

[54] **OVERHUNG DISK CHIPPER**

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[73] Assignee: **Nicholson Manufacturing Company,** Seattle, Wash.

[22] Filed: **Aug. 27, 1973**

[21] Appl. No.: **391,628**

[30] **Foreign Application Priority Data**

Sept. 5, 1972 Canada 150963

[52] **U.S. Cl.** ..... **241/55,** 144/176, 241/92, 241/278 R

[51] **Int. Cl.** **B02c 18/14**

[58] **Field of Search** ..... 241/55, 56, 92, 278 R; 144/176

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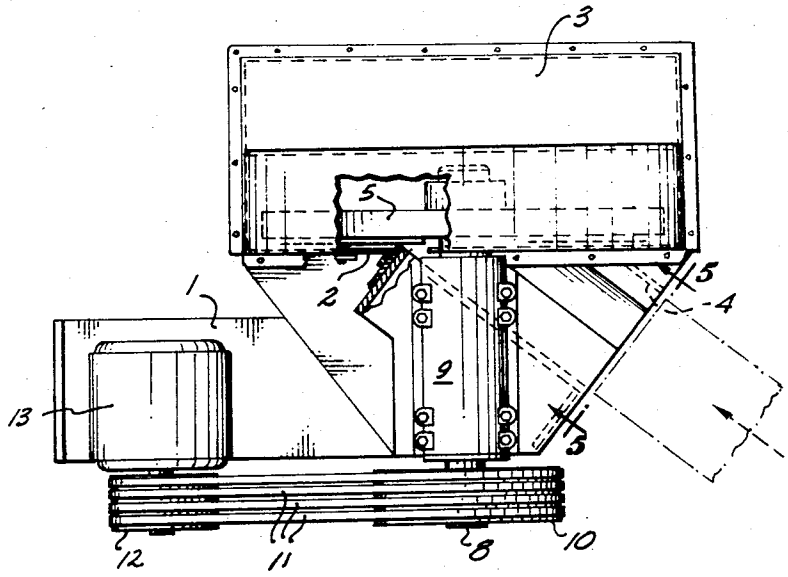
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Primary Examiner—Granville Y. Custer, Jr.
Assistant Examiner—Howard N. Goldberg
Attorney, Agent, or Firm—Robert W. Beach

[57] **ABSTRACT**

An overhung chipper disk is mounted on one cantilever end of a stub shaft, and a drive pulley is mounted on the other end of such shaft. The disk-supporting end of the shaft extends through one side of a chip-receiving housing enclosing the chipping disk from which chips are discharged through a bottom discharge opening or are blown out of the upper portion of the housing by a centrifugal blower, the impeller of which is mounted on the chipping disk. An infeed spout is connected to the upright side of the housing through which the chipping disk extends, either above the shaft, alongside the downwardly turning side of the shaft or below the shaft, at an outer angle of 37½° relative to the plane of the chipping disk. A portion of the housing side opposite the infeed spout may be inclined downward away from the chipping disk to reduce impact of chips against the housing wall. The air inlet for a chip discharge blower may be located in registration with the infeed spout connection, so that the inflowing air current blowing onto the chips will deter their impact against the housing.

4 Claims, 20 Drawing Figures



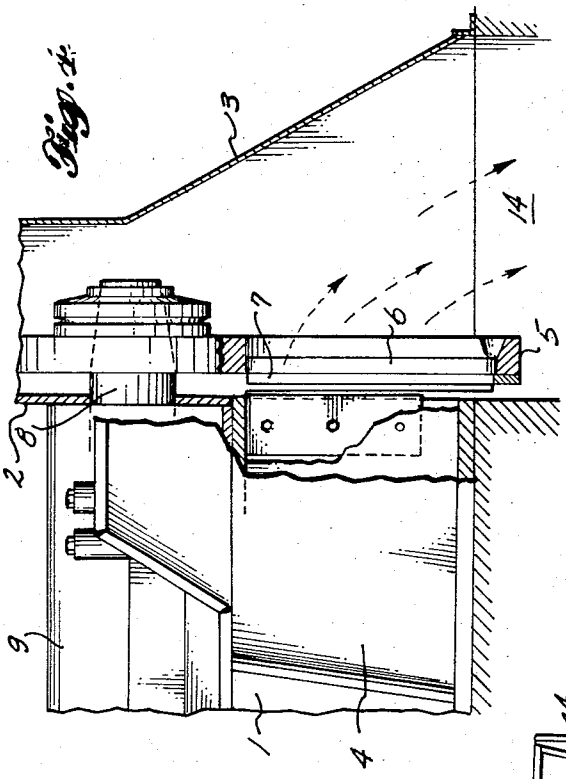


Fig. 4.

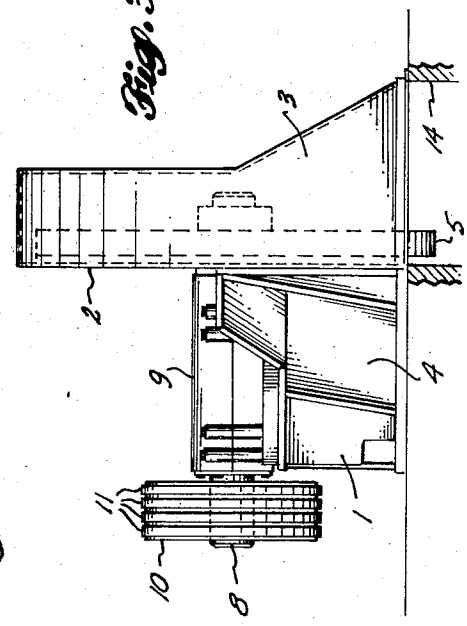


Fig. 3.

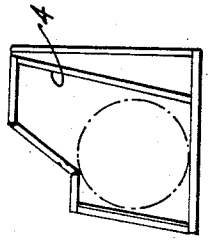


Fig. 5.

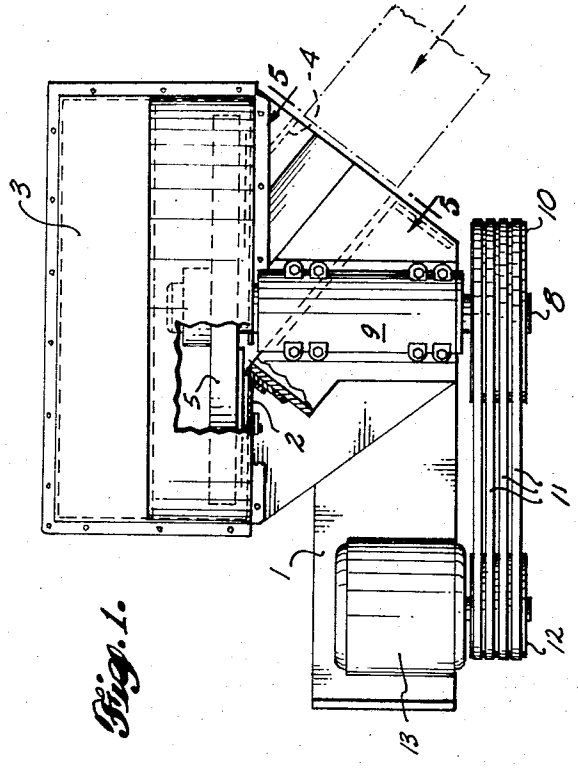


Fig. 1.

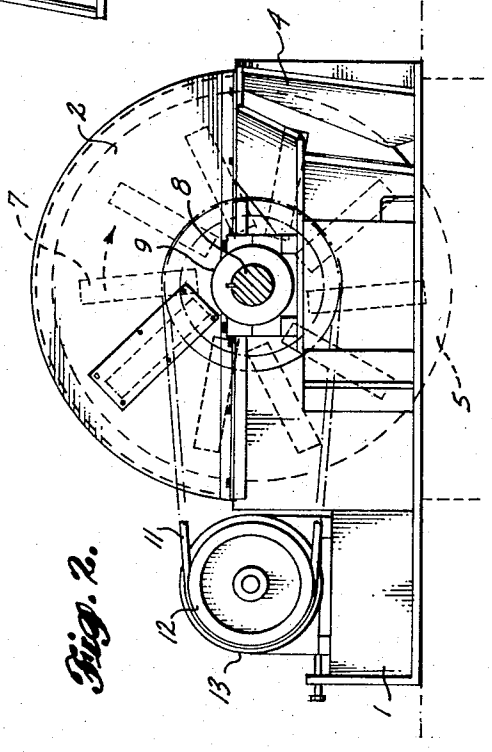


Fig. 2.

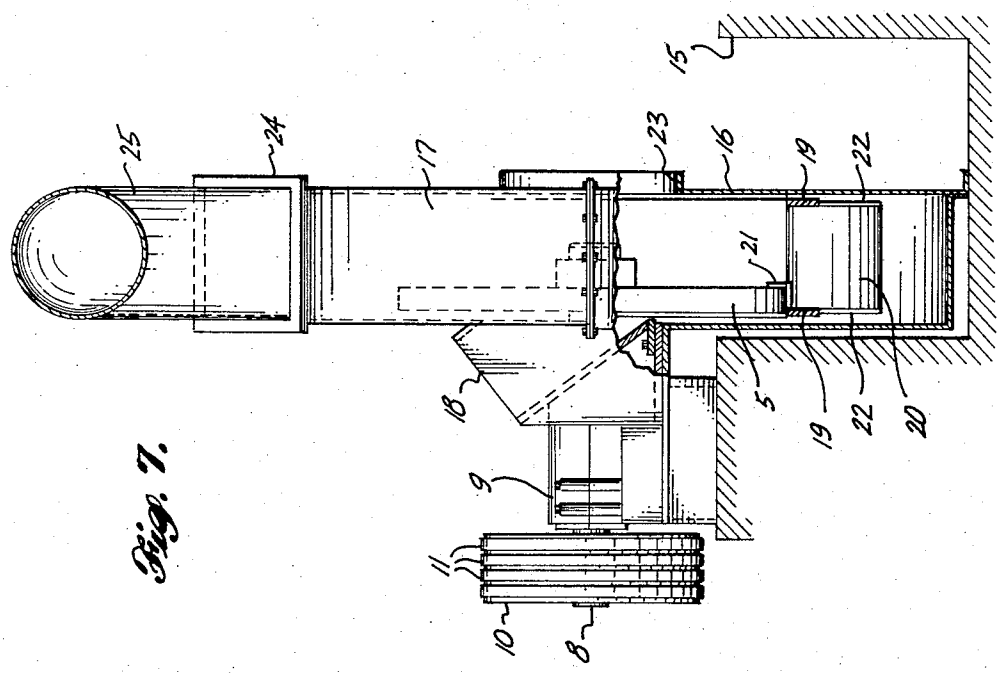

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Fig. 7.

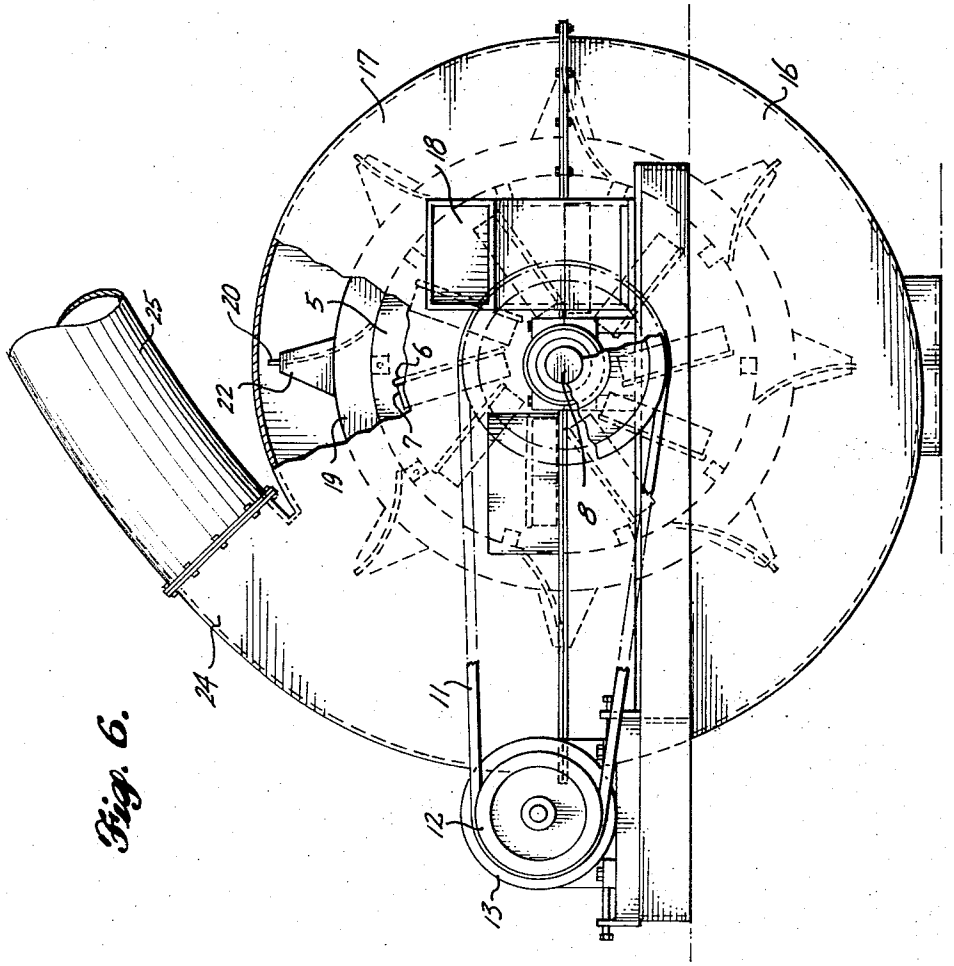

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Fig. 6.

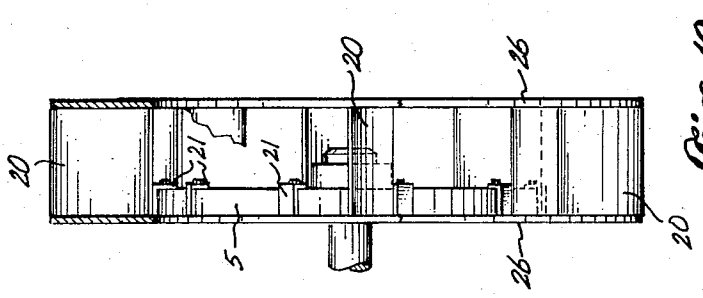


Fig. 10.

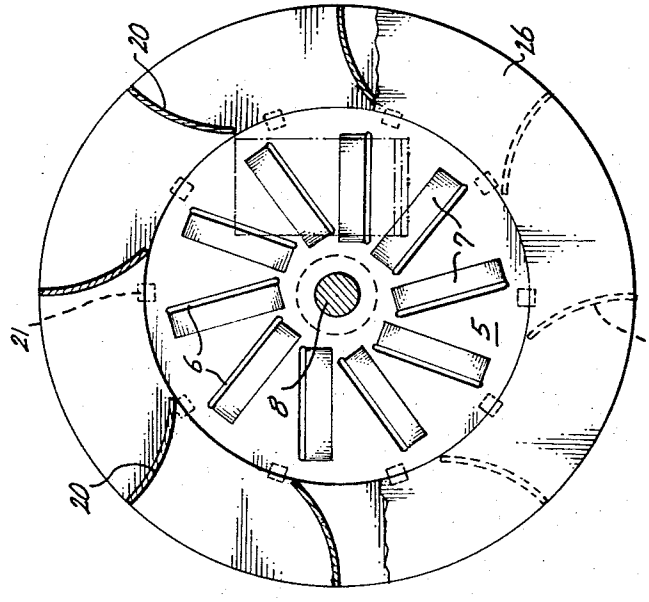


Fig. 9.

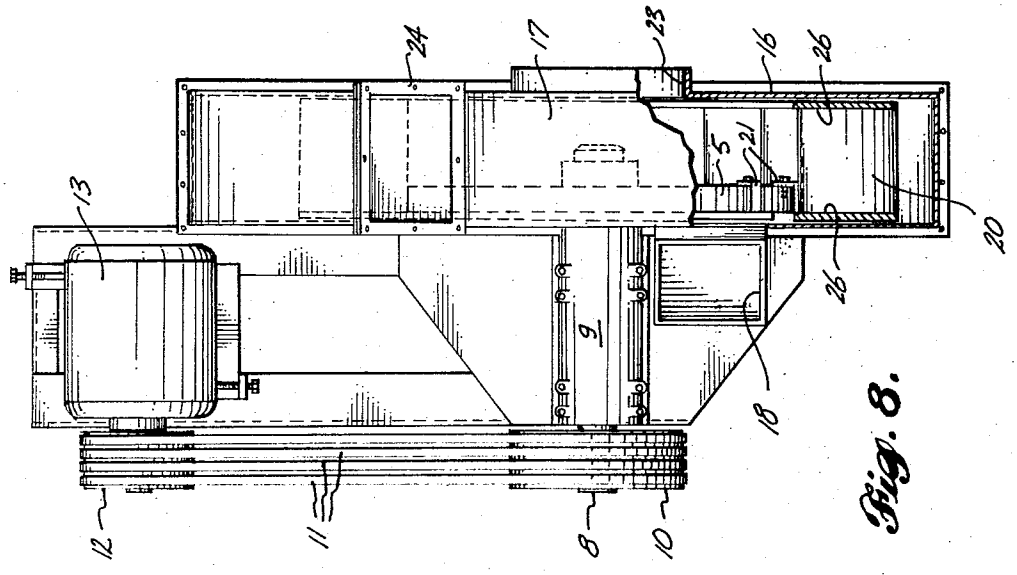


Fig. 8.

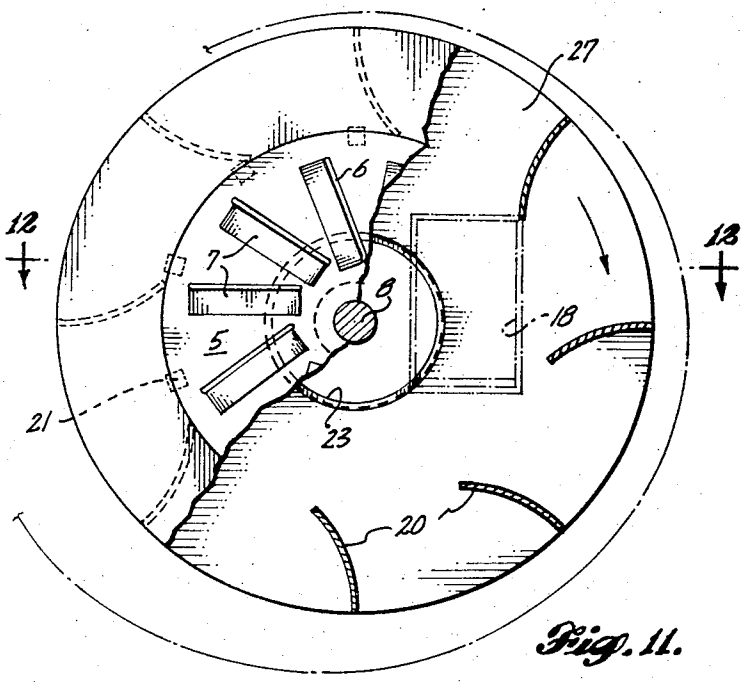


Fig. 11.

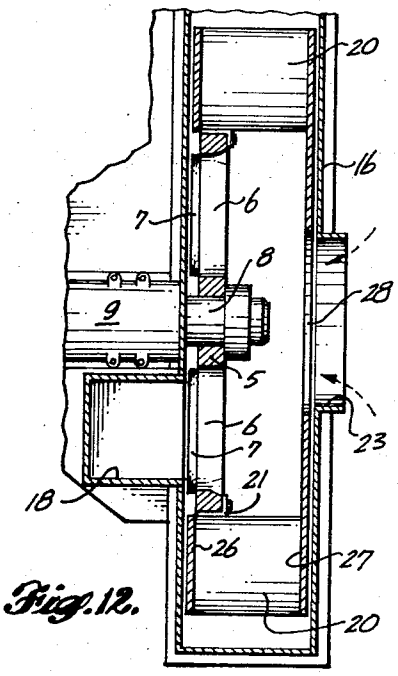


Fig. 12.

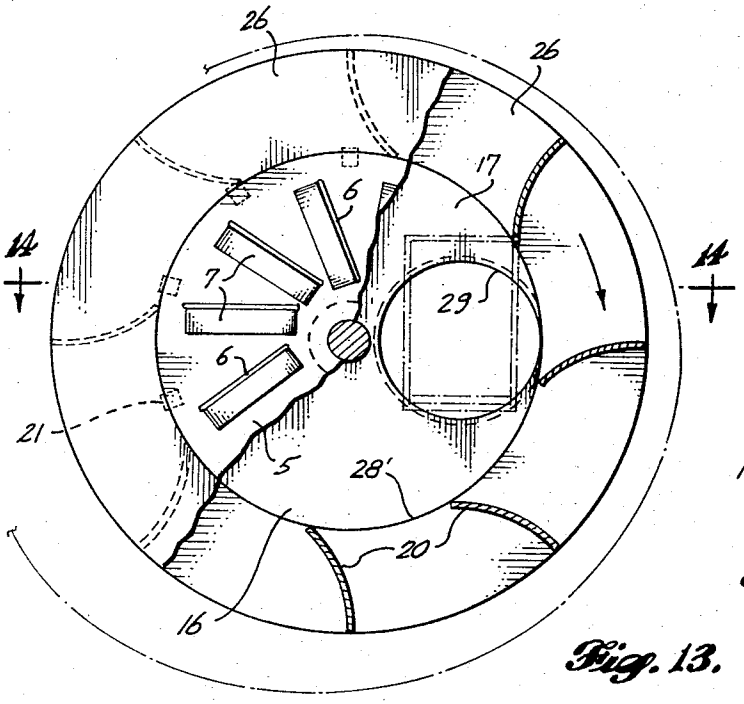


Fig. 13.

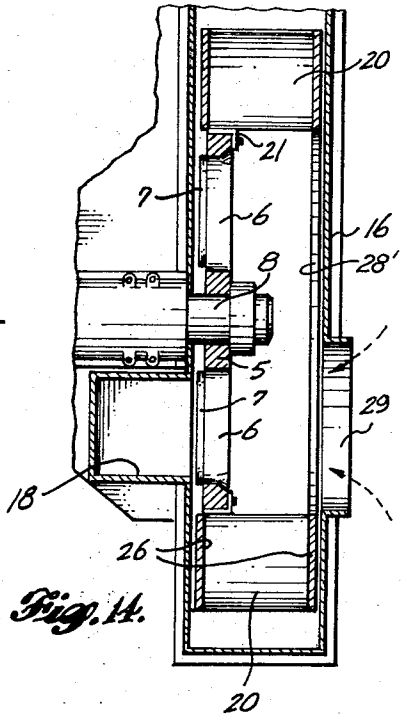


Fig. 14.

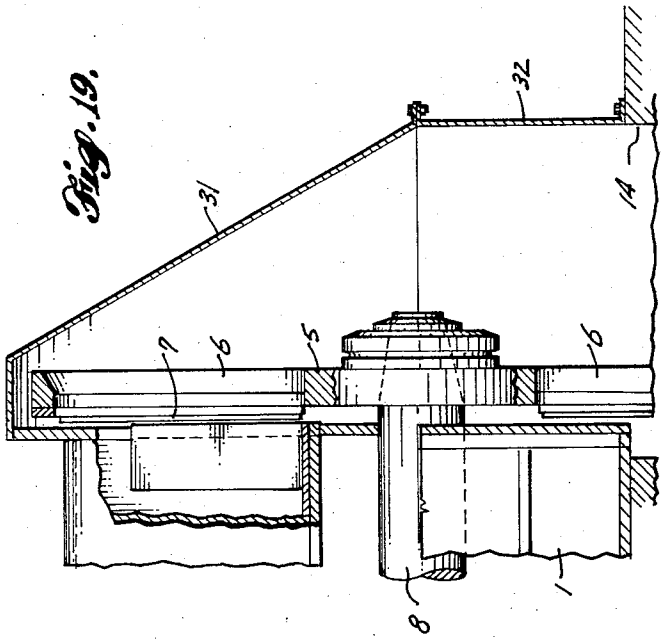


Fig. 19.

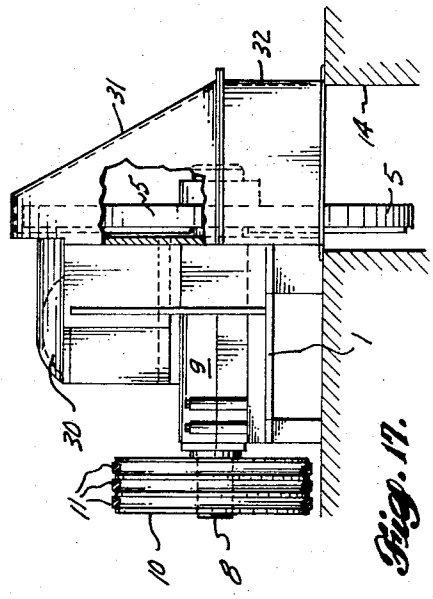


Fig. 17.

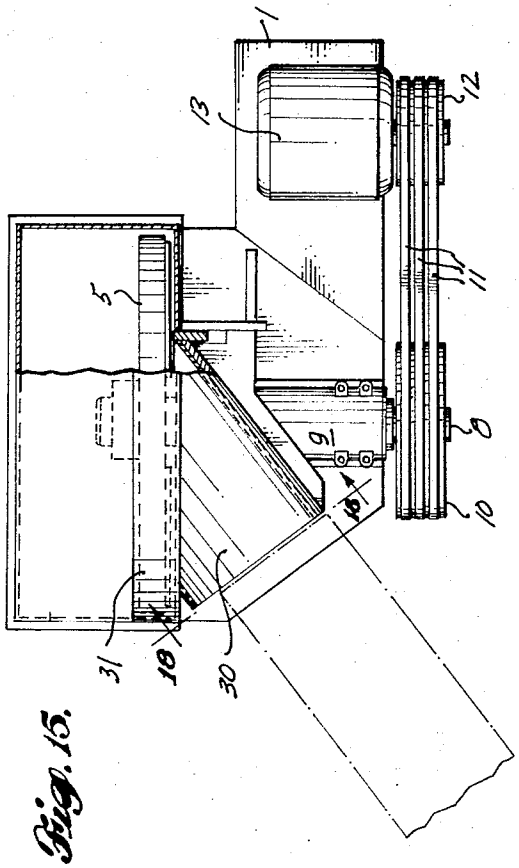


Fig. 15.

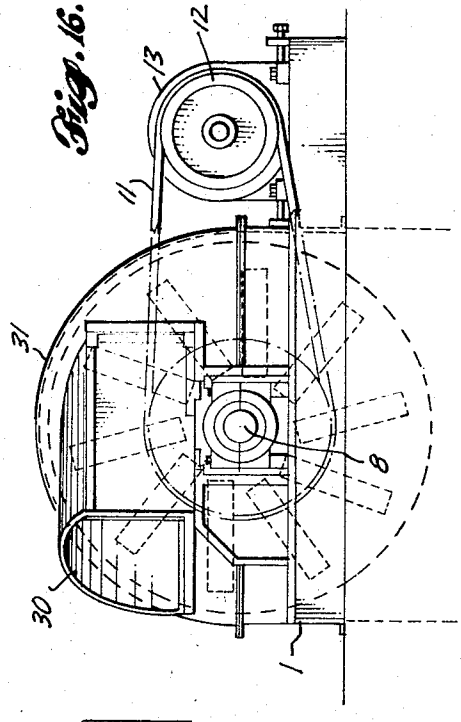


Fig. 16.

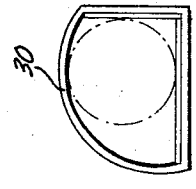
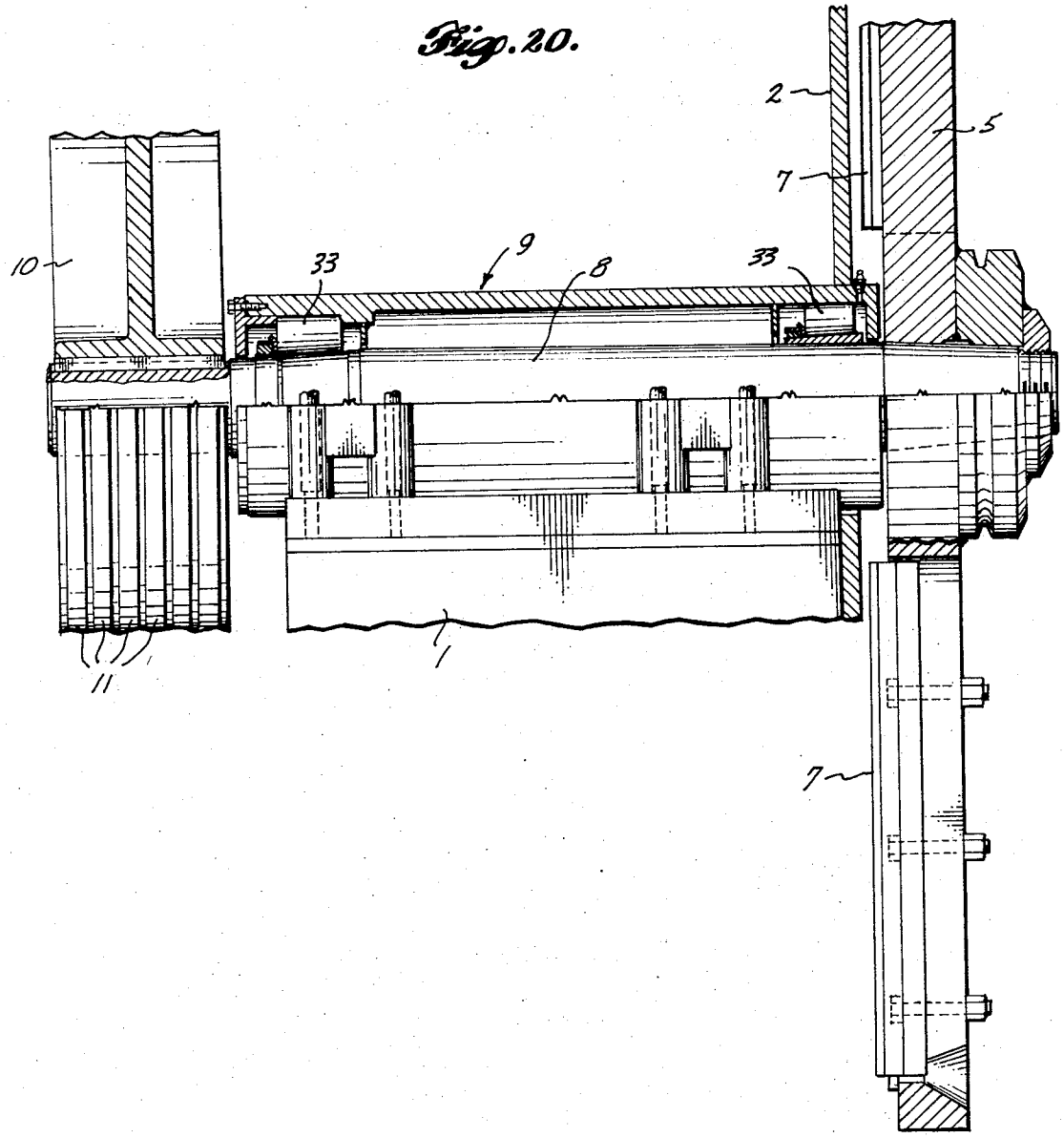


Fig. 18.

Fig. 20.



OVERHUNG DISK CHIPPER

The chipper of the present invention is of the disk type, sometimes referred to as a "front end drive" chipper, and is intended for chipping wastewood, including mill ends, and also logs.

A principal object is to provide a chipper which is of compact construction and which will minimize impact of chips produced against a stationary wall, which impact tends to break up the chips.

More specifically, it is an object to provide a chipper having an overhung chipping disk received in a housing to which wood to be chipped is fed from the same side that the chipping disk is supported, so as to minimize structure against which chips cut by the disk can be thrown.

Another object is to provide a chipper construction which is versatile by enabling the feed spout to be placed at different locations relative to the chipping disk.

An additional object is to provide a chipper including a blower for conveying chips cut, which blower is arranged to reduce the breakage of such chips.

A further object is to reduce dynamically the velocity of chips discharged from a chipping disk, so as to reduce breakage of chips striking structure of the chipper.

FIG. **1** is a plan of a chipper according to the present invention, with parts broken away.

FIG. **2** is an end elevation of the chipper.

FIG. **3** is a side elevation of the chipper.

FIG. **4** is an enlarged fragmentary side elevation of a portion of the chipper of FIGS. **1, 2** and **3,** having parts broken away, and

FIG. **5** is a detail elevation of the feed spout of the chipper.

FIG. **6** is an end elevation and

FIG. **7** is a side elevation of an alternative type of chipper according to the present invention, parts being broken away.

FIG. **8** is a plan of a chipper similar to that shown in FIGS. **6** and **7,** but somewhat modified, having parts broken away.

FIG. **9** is an end elevation of a component of the chipper shown in FIG. **8** with parts broken away, and FIG. **10** is a side elevation of such chipper component, having parts broken away.

FIG. **11** is an end elevation of a chipper component similar to FIG. **9,** but of somewhat different construction, with parts broken away, and

FIG. **12** is a section taken on line **12—12** of FIG. **11.**

FIG. **13** is an end elevation of a chipper component similar to that shown in FIG. **9** and that shown in FIG. **11,** but having still different structural features, parts being broken away, and

FIG. **14** is a section through such component taken on line **14—14** of FIG. **13.**

FIG. **15** is a plan of another form of chipper according to the present invention with parts broken away.

FIG. **16** is an end elevation and

FIG. **17** is a side elevation of such chipper, having parts broken away.

FIG. **18** is a detail elevation of a portion of such chipper taken on line **18—18** of FIG. **15.**

FIG. **19** is an enlarged detail vertical section through a portion of the chipper shown in FIGS. **15, 16** and **17,** with parts broken away.

FIG. **20** is a detail elevation of a component of the chipper having parts broken away.

An advantageous feature of the chipper of the present invention is its compactness to which the small base **1** makes an important contribution. Such base supports the working parts of the chipper from which chips are discharged into a housing having an upright side **2** adjacent to the chipper. The opposite side **3** of the housing has a lower portion which preferably is inclined downwardly away from the upright side **2,** as shown in FIGS. **3** and **4.** The upper portion of such housing can be substantially semicylindrical having parallel upright sides.

Chunks, or even logs, of wastewood to be chipped can be fed lengthwise through the feed spout **4** toward the chipping disk **5** located in the casing **2, 3.** Such chipping disk has radial slots **6** through it for passage of chips cut from the wood by radially extending knives **7** carried by the disk. As shown best in FIGS. **3** and **4,** the chipping disk **5** is of the overhung type, being mounted on the cantilever end of stub shaft **8** which projects through the upright wall **2** of the housing. The feed spout **4** is connected to this same housing wall at a location below the shaft **8,** so that the chipper may be termed an underfeed type.

The central portion of the stub shaft **8** is mounted on the base **1** by a long bearing assembly **9,** so that the opposite ends of such shaft are supported in cantilever fashion. As stated, one end of such shaft projects through the housing wall **2** into the chip-receiving housing, and the chipping disk **5** is mounted on it. A drive pulley **10** for rotating the stub shaft is mounted in overhung fashion on its other cantilever end. Drive belts **11** of the V-belt type connect the shaft pulley **10** and a motor pulley **12** driven by motor **13** to rotate the chipping disk **5.** Because of the compact arrangement of the chipping disk **5** and shaft **8,** the drive motor **13** and the feed spout **4,** the base **1** supporting these components can be quite small and comparatively light and inexpensive.

As indicated by the broken arrow in FIG. **2,** the chipping disk **5** rotates in clockwise direction, as viewed from the disk-mounting end of the shaft. The axis of the feed chute **4** is inclined at an acute angle of 37½° relative to the plane of the chipping disk, as shown in FIG. **1,** so that the knives **7** will cut from a side of a piece of wood fed lengthwise into the chute toward the leading end of the piece. In addition, it is preferred that the radially outer end of each knife trail its radially inner end to some extent. Consequently, the knife will slice chips from the wood piece, instead of chopping directly against the grain.

Chips cut by the chipping disk knives **7** are impelled through the slots **6** of the disk with considerable momentum by the cutting action, as indicated by the arrows in FIG. **4.** It is highly desirable to minimize breakage and splintering which could result from impact of the chips discharged through slots **6** against a stationary wall or other structure, such as a shaft or shaft housing., close to such slots. Where the feed spout is of the underfeed type, as shown in FIGS. **1** to **5,** inclusive, and such spout is connected to the same wall **2** of the chip-receiving housing as that through which the cantilever end of the stub shaft **8** extends, it is feasible to locate the wall **3** of the housing opposite wall **2** at a considerable distance from the chipping disk slots **6** through which the chips pass.

FIGS. 3 and 4 show the lower portion of the housing side 3 as being inclined downward away from the housing side 2 from approximately the elevation of the shaft 8. The bottom of the housing is completely open to provide a bottom chip discharge chute 14. Since the trajectory of the chips discharged through the lower disk slots 6 is downward, the lower portion of the wall 3 slopes downward away from the chipping disk, and such wall is located a considerable distance from the chipping disk, any chips which strike the lower portion of wall 3 will approach the wall at a small angle of incidence, so as to reduce the force of impact of such chips with the wall and thereby minimize shattering of the chips. Such wall contour and location is made possible by utilizing a chipping disk of the overhung type carried by a stub shaft mounted at the same side of the chip-receiving housing as the feed spout.

In the alternative type of chipper shown in FIGS. 6 and 7, the chips, instead of being discharged by gravity, are blown by a current of air to a storage bin or location for utilization. In this chipper, the overhung chipping disk 5 and drive pulley 10 again are carried by the opposite cantilever ends of a stub shaft 8 mounted on the base 1 by a long bearing assembly 9. The principal difference of this chipper over that shown in FIGS. 1 to 5 is in the chip-receiving casing and blower mechanism. A well 15 is provided alongside the support for the chipper base 1 for receiving the lower portion 16 of a centrifugal blower scroll housing, which is of generally semicylindrical shape. The upper portion 17 of such housing, also of generally semicylindrical shape, is mounted on the lower housing section 16.

The entire blower housing 16, 17 is supported with its opposite planar sides upright. The stub shaft 8 is substantially horizontal, and its cantilever end carrying the chipping disk 5 projects through one of the upright sides of the chip-receiving housing. A feed spout 18, through which pieces of wood to be chipped are fed, connects to the same side of the blower housing as that through which the end of shaft 8 supporting chipping disk 5 projects. Consequently, there is no mechanical structure, such as a shaft end and bearing, to limit the practical axial width of the housing 16, 17. In the chipper of FIGS. 6 and 7, the feed spout 18 is shown as being inclined at an acute angle of 37½° relative to the plane of the chipping disk downwardly toward the upright wall of the chip-receiving housing to which it is connected. Consequently, such a chipper may be designated as a drop-feed chipper. As shown in FIG. 6, the feed spout enters the same side of the housing as shaft 8 but at a location offset from the shaft and at approximately the same elevation.

Chips cut by the knives of chipping disk 5 are impelled through the slots 6 of such disk into the lower portion 16 of the chip-receiving housing. The chips are blown from such housing by the current of air produced by a centrifugal blower impeller rotated in the housing. Such impeller includes annular sideplates 19 secured to the opposite ends of the blower vanes 20. One of the sideplates 19 is secured to the periphery of the chipping disk 5 at circumferentially spaced locations by mounting angles 21, so that the blower impeller is carried and rotated by the chipping disk 5.

The outer portion of the edges of blower vanes 20 are supported by gussets 22 projecting radially outwardly from the sideplates 19 and secured to the blade ends. It will be seen from FIGS. 6 and 7 that the annular sideplates 19 of the blower impeller are radially quite narrow, and their inner diameters are the same and approximately equal to the diameter of the chipping disk 5. The leading sides of the blower vanes 20 preferably are concave to increase the effectiveness of the impeller in producing an air current.

Air is admitted to the blower casing 16, 17 through the air inlet opening 23 in the central portion of that wall of the blower housing opposite that through which the cantilever end of shaft 8 projects. Air and chips are discharged tangentially of the housing through the outlet 24. A discharge duct 25 leading to a storage bin or chip utilization location is connected to the housing outlet. Chips discharged into the housing through the slots 6 are picked up by the air current produced by the blower impeller and carried around the housing to the outlets 24 through which they are discharged into the duct 25.

FIGS. 8, 9 and 10 show an alternative type of impeller construction in which the radially narrow annular sideplates 19 of the rotor shown in FIGS. 6 and 7 are replaced by sideplates 26 of a radial width equal to the full radial extent of the blower vanes 20. Use of side plates of such width eliminates the need for the supporting gussets 22.

Chips cut by the blades 7 of the chipping disk 5 may be impelled through the slots 6 of the disk with sufficient momentum that they will strike the wall of the lower casing section 16 opposite that through which shaft 8 projects with a force great enough to fracture the chips to a greater or lesser extent. Such tendency for chip damage can be reduced by modifying the construction of the impeller shown in FIGS. 6 and 7, or in FIGS. 8, 9 and 10, to the construction of FIGS. 11 and 12. In this instance, the edges of the vanes 20 adjacent to the wall of the housing through which shaft 8 projects are secured to an annular sideplate 26 of the type described in connection with FIGS. 8, 9 and 10.

In the blower of FIGS. 11 and 12, the edges of blades 20 remote from the casing wall through which the shaft 8 projects are secured to an annular impeller side plate 27, which is of a radial width extending from the housing air inlet housing aperture 23 to the radially outer edges of vanes 20. The inner periphery of the sideplate 27 therefore provides an opening 28 through which air can pass from the inlet 23 to the interior of the impeller, which opening is approximately the same size as the size of the air inlet.

With this rotor construction, the rotary side plate 27 overlies and masks the side of the blower housing opposite that through which shaft 8 projects so as to protect the chips from striking the stationary wall of the housing. On the contrary, any chips which are carried axially across the blower impeller will strike only the rotating plate 27, which will decrease greatly the force with which the chips strike the plate and reduce chip breakage.

With the blower construction shown in FIGS. 13 and 14, the prospect of chip damage is still farther reduced. The impeller construction of this chipper is the same as that shown in FIGS. 8, 9 and 10, including annular side plates 26 secured to the opposite axial ends of blower vanes 20. In this instance, however, instead of the air inlet aperture to the housing being located substantially in the center of the housing, as is the inlet 23 shown in FIG. 8, the inlet 29 is offset from the center of the housing, so as to be located in substantially axial registration

with the connection of the feed spout **18** to the housing wall, as shown in both FIGS. **13** and **14.** The central aperture **28'** in plate **26** opposite the chipping disk **6** is large enough to overlap the offset air inlet **29,** as shown in FIGS. **13** and **14.**

Since the cutting of the chips occurs substantially at the location of the connection of feed spout **18** to the housing wall, the chips will be impelled through the slots **6** substantially in registration with such feed spout connection. The momentum of air entering the inlet opening **29** will prevent emergence of any appreciable quantity of chips from such air inlet opening, and the air current will oppose and quell the momentum of the chips passing through the slots **6.** Consequently, the chips will be entrained almost immediately by the inflowing air and diverted into an orbital path through the blower, so as to eliminate virtually all risk of the chips striking any surface of the blower with a force sufficiently great to fracture the chips.

In the alternative type of chipper shown in FIGS. **15** to **19,** inclusive, the feed spout **30** is located at an elevation higher than the shaft **8,** so that such chipper may be designated as an overfeed or spout-over-shaft type. As in the chippers described above, the length of the feed spout is substantially parallel to a horizontal plane but again, as in the device of FIGS. **1** to **3,** is arranged with its axis at an angle to the wall of the chip-receiving housing to which the spout connects at an acute angle of 37½° relative to the portion of the chipping disk **5** moving toward the feed spout, i.e., the upwardly moving portion of the chipping disk. In this instance, the chips are discharged from the housing through a gravity discharge chute **14.**

In order to reduce breakage of chips by striking a stationary housing wall with a hard impact the upper portion **31** of the side opposite the housing side through which shaft **8** projects is inclined downwardly away from that casing side. Consequently, if chips impelled through slots **6** in the upper portion of the chipping disk **5** strike the housing wall **31** at all, such striking will be at a glancing angle, so that the tendency of the chip to be injured will be greatly reduced.

The lower portion **32** of the side of the housing opposite that through which shaft **8** projects can be upright as shown in FIGS. **17** and **19,** because, by the time the chip has fallen through the upper portion of the housing, its trajectory will be principally downward, so that, again, if a chip strikes the housing wall, it will be with a glancing impact which will not have a great tendency to fracture the chip. The prospect of chips striking the wall of the housing opposite the chipping disk can be further reduced by increasing the width of the housing conveniently, because of the overhung type of construction of the chipping disk and the arrangement in which the feed spout connects to the same side of the housing through which the shaft **8** supporting the chipping disk projects.

Details of suitable shaft-bearing structure are shown in FIGS. **20.** The long bearing assembly for the shaft **8** includes anti-friction bearings **33,** preferably of the spherical roller bearing type spaced lengthwise of the stub shaft **8.**

I claim:

1. An overhung disk chipper comprising a base, a generally horizontal drive shaft carried rotatively by said base and having a cantilever end portion, an overhung chipping disk carried rotatively by said cantilever end portion of said drive shaft for upward movement of the portion of said chipping disk at one side of said shaft and downward movement of the portion of said chipping disk at the other side of said shaft and said chipping disk carrying chip-cutting bits on the side thereof to which said shaft is connected for cutting wood into chips, a housing for said chipping disk having an upright wall at the same side of said chipping disk as said shaft, and an elongated feed spout at the same side of said chipping disk as said shaft and housing upright wall, having an end connected to said housing upright wall only at a location above said shaft and having its length disposed substantially parallel to a horizontal plane and at an acute angle relative to the upwardly-moving portion of said chipping disk for guiding pieces of wood to be cut into chips to move lengthwise of such wood pieces and lengthwise of said feed spout through said housing upright wall to said chipping disk.

2. The chipper defined in claim **1,** in which the housing includes a second wall at the side of the chipping disk opposite the upright wall, and said second wall has a portion higher than the shaft inclined downwardly away from the upright wall for deflecting downward chips passing through the upper portion of the chipping disk.

3. An overhung disk chipper comprising a base, a generally horizontal drive shaft carried rotatively by said base and having a cantilever end portion, an overhung chipping disk carried rotatively by said cantilever end portion of said drive shaft and carrying chip-cutting bits on the side thereof to which said shaft is connected for cutting wood into chips, a housing for said chipping disk having an upright wall at the same side of said chipping disk as said shaft, an elongated feed spout at the same side of said chipping disk as said shaft and housing upright wall, having an end connected to said housing upright wall and having its length disposed at an acute angle relative to the portion of said chipping disk moving toward said feed spout for guiding pieces of wood to be cut into chips to move lengthwise of such wood pieces and lengthwise of said feed spout, and rotary blower means in said housing operable to blow therefrom chips cut by said chipping disk, said housing including a second wall at the side of said chipping disk opposite said upright wall, and said second wall having an air inlet opening for said blower means located generally in registration transversely of said chipping disk with the connection of said feed spout to said housing upright wall and of generally the same size as the end of said feed spout connected to said housing upright wall.

4. The chipper defined in claim **3,** in which the blower means includes an impeller mounted in cantilever fashion on the chipping disk, and said impeller includes an annular plate at the side of said impeller opposite the chipping disk and having a central aperture overlapping the air inlet opening.

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