United States Patent

[11] **3,570,773**

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[21] Appl. No. **752,812**
[22] Filed **Aug. 15, 1968**
[45] Patented **Mar. 16, 1971**

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[54] **CHIPPER FEEDER**
8 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **241/81,**
198/220, 241/92
[51] **Int. Cl.** **B02c 18/22**
[50] **Field of Search** 241/81, 92,
101, 79.1, 34, 301, 245, 255; 144/(Inquired);
198/220, 220 (C-10)

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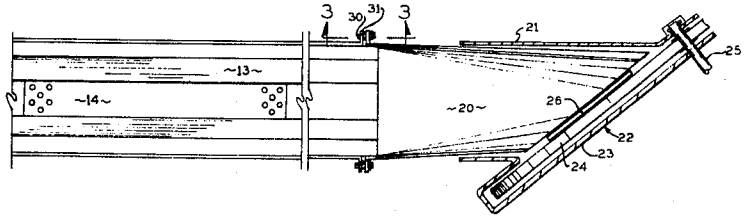
ABSTRACT: A vibratory conveyor specially designed for ruggedness and ability to align elongated pieces of material and feed them through the infeed spout of a power driven chipper provides a virtually jam proof, maintenance free apparatus for reducing random length scrap lumber to chips suitable for use in pulp mills. The conveyor includes a screen section and a metal detecting section, the latter being arranged to stop the conveyor upon detecting any metal in material being fed to the chipper.



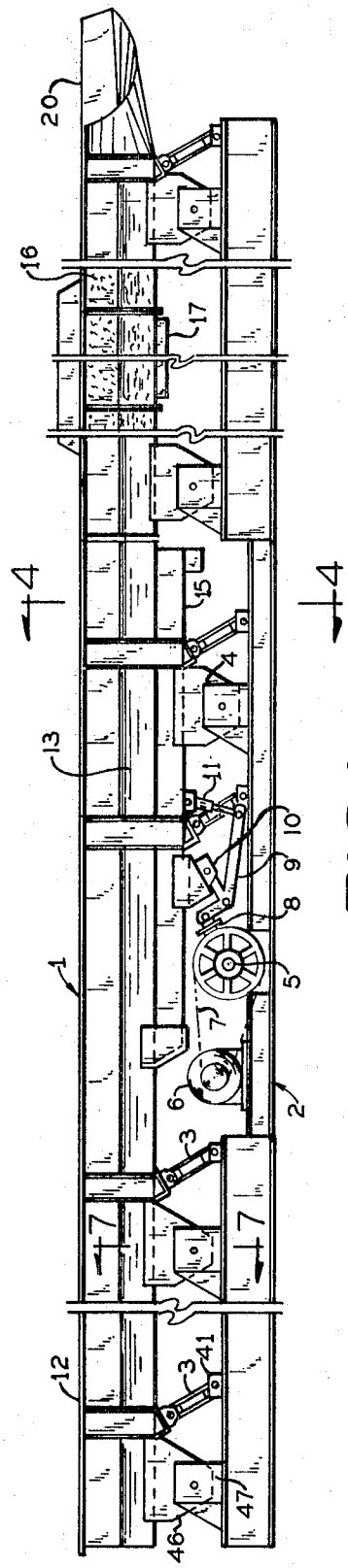


FIG. 1

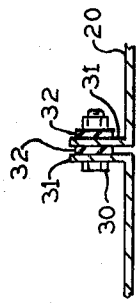


FIG. 3

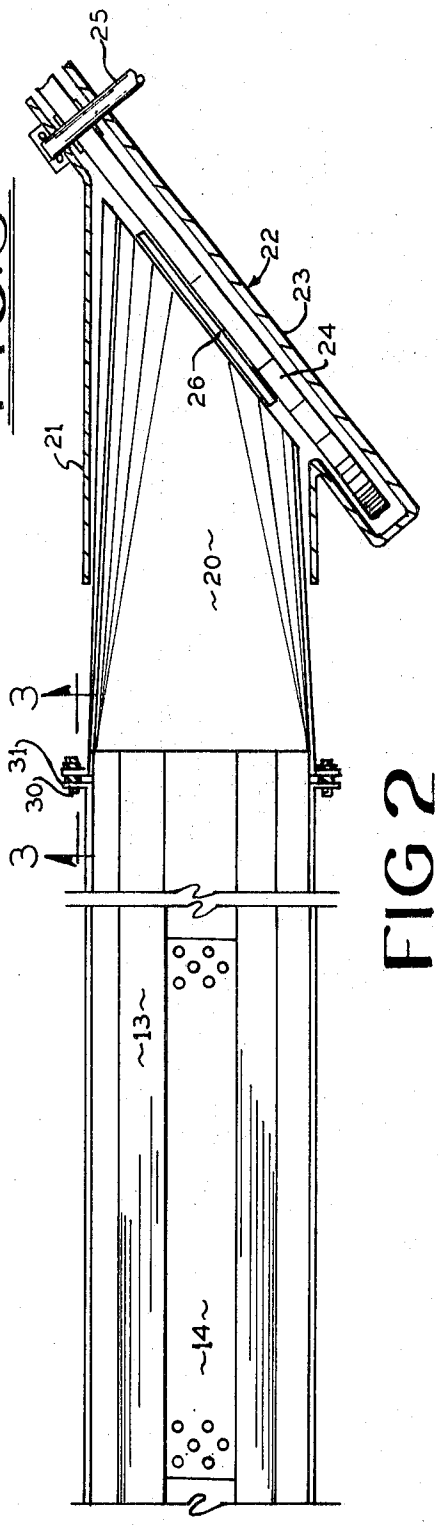


FIG 2

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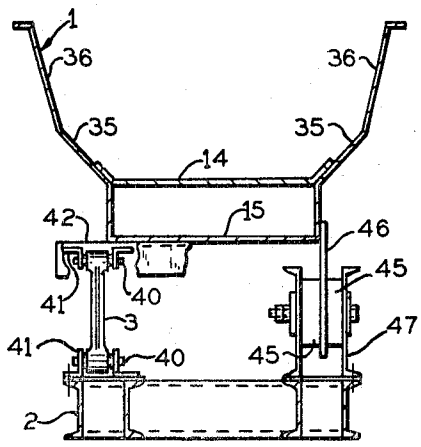

FIG.4

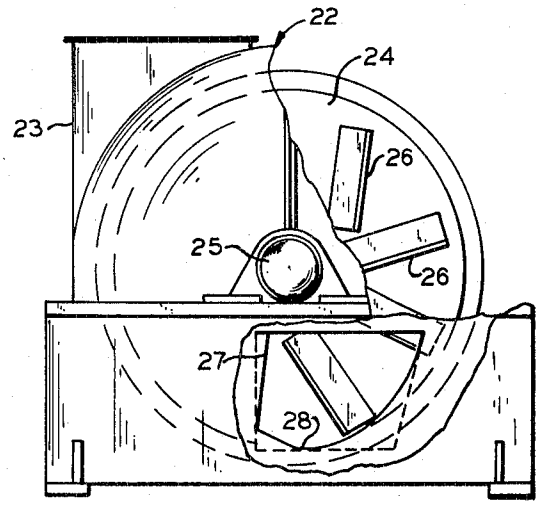

FIG.5

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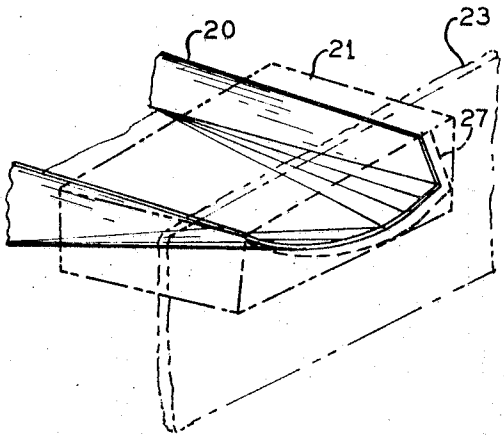

FIG. 6

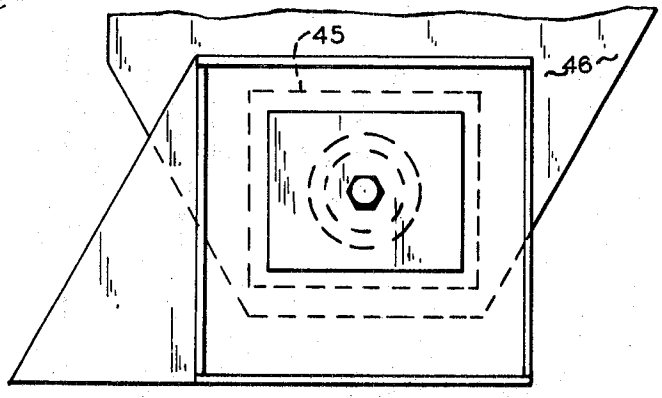

FIG. 8

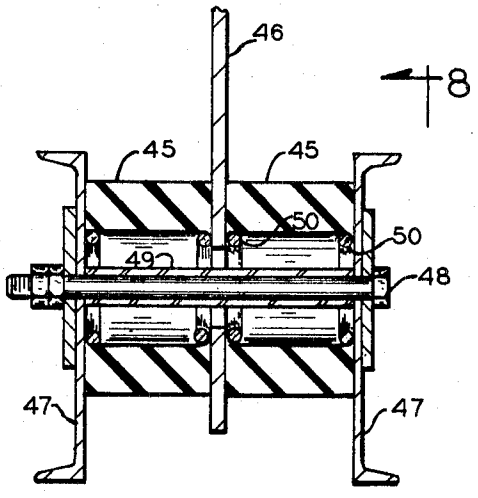

FIG. 7

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CHIPPER FEEDER

BACKGROUND OF THE INVENTION

Power driven chippers are used to reduce scrap lumber to chips for processing into paper or similar products. It has been customary to use belt or chain conveyors to feed the scrap lumber into the chipper input spout. This arrangement suffers from several disadvantages, the principal one being the unavoidable gap between the end of the conveyor flight and the anvil of the chipper in which material may be caught or lodge and the inability of a belt or chain conveyor to clear a tangled mass of random length lumber scraps and align them for orderly feeding into the chipper. In fact, it has been customary to station an attendant alongside the belt or chain conveyor to clear the tangles or jams as they occurred.

OBJECTIVES OF THE INVENTION

The principal object of the invention is to provide a rugged vibratory feeder and chipper arrangement in which random sized, scrap lumber is aligned by the vibratory motion of a vibratory conveyor trough and is fed to within a very short distance from the chipper knives.

Another object of the invention is to provide a conveyor chipper arrangement in which a resiliently yieldable discharge section of the conveyor is backed up by the chipper structure to minimize the lateral forces applied to the conveyor as lumber is drawn into the chipper.

These and more specific objects and advantages are obtained in a vibratory conveyor and chipper combination in which the conveyor trough is supported on resilient means providing a low impedance to vibratory motion along a desired path of vibration and a stiff resilient opposition to lateral motion of the conveyor and in which a discharge section of the conveyor generally conforms to and, with clearance for vibratory motion, is inserted into the infeed spout of the chipper.

A preferred form of chipper-feeder combination constructed according to the invention is illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a side elevation of the improved conveyor or feeder portion of the improved combination.

FIG. 2 is a fragmentary plan view of portions of the conveyor feeder and a fragmentary portion of the chipper illustrating the cooperation between the discharge end of the feeder and infeed of the chipper.

FIG. 3 is a detail view, at enlarged scale, of one of the resilient connectors attaching the discharge section of the conveyor to the adjacent section.

FIG. 4 is a cross-sectional view of the feeder taken along the line 4–4 of FIG. 1 to show representative rocker arm supports and rubber shear spring supports for the feeder.

FIG. 5 is a front elevation of the chipper with parts broken away to show portions of the internal structure of the chipper.

FIG. 6 is a fragmentary isometric view of the discharge end of the feeder and the cooperating anvil portion of the inlet spout of the chipper.

FIG. 7 is a vertical transverse sectional view of one of the rubber shear spring supports for the feeder.

FIG. 8 is an enlarged front elevation of one of the rubber shear spring supports for the feeder.

These specific FIGS. and the accompanying description are intended merely to illustrate the invention and not to impose limitations on its scope.

The conveyor-feeder portion of the invention, as illustrated in side elevation in FIG. 1, comprises an extended trough 1 that is preferably supported from a base 2 by means of a series of pairs of rocker arms 3 and rubber shear spring assemblies 4. The conveyor is driven by a motor driven crank and connecting rod mechanism comprising an eccentric shaft 5 that is driven from a motor 6 by means of a belt 7. The eccentric shaft 5 drives a connecting rod 8 connected to one end of a lever 9 pivoted on a bracket 10 depending from and attached to the conveyor trough 1. The far end of the lever 9 is connected through a hydraulic shock absorber 11 to the trough 1. This particular drive mechanism, as explained in U.S. Pat. No. 2,630,211, provides an efficient positive drive for vibrating the conveyor-feeder trough 1 while still allowing the trough to move slowly in response to the variations in load without imposing large static forces on the eccentric shaft 5.

The conveyor-feeder trough 1 preferably includes a loading section 12, shown at the left end of FIG. 1, and a screening section 13 having a perforated deck 14, FIGS. 2 and 3, including a collecting trough 15 feeding into a disposal conveyor or means not shown. Downstream, to the right in FIG. 1, the feeder trough 1 includes a nonmetallic section 16 equipped with a metal detector 17 which, by means not shown in the drawings, is arranged to stop the feeder should any metallic objects that would damage the blades in the chipper be detected in the material flowing toward the chipper. Such objects might include metallic tools carelessly dropped by personnel or metal imbedded in the scrap lumber being processed.

One important element of the invention is the discharge end of the feeder-trough 1 which comprises a specially shaped trough section 20 that is attached preferably by a resilient connection, to the next preceding section of the feeder trough 1. This discharge trough section 20 extends into an infeed spout 21 of a chipper 22, a portion of which is shown at the right end of FIG. 2. The chipper 22 comprises a housing 23 enclosing a heavy power driven disc rotor 24 carried on a shaft 25. The disc rotor 24 is equipped with knives 26 arranged to slice chips off the ends of scrap lumber fed into the chipper (see also FIG. 5). As seen in FIGS. 2 and 6 the discharge end 20 of the conveyor-feeder 1 and particularly the end portion thereof, extends into and is shaped to conform to the shape of the anvil section of the chipper. The anvil section is that portion of the infeed spout 21 and chipper housing adjacent the path of the knives 26 that supports the material being chipped as the knives 26 slice across the ends of the pieces of material being fed into the chipper. As may be seen in FIG. 5, the anvil section includes a substantially vertical or slightly inclined section 27 serving as a first reaction face and a generally arcuate section 28 serving as a second or locating face. The knives 26, while arranged to be generally radial with respect to the heavy rotor disc 24 are swept back with the radially outermost portions lagging behind the radially inner portions of the knives so that, as the knives 26 sweep past the anvil sections 27 and 28, the knives slice across the ends of any material being fed into the chipper rather than a straight or chisel type cut.

When pieces of material being chipped, which may be pieces of scrap lumber ranging in size from a few inches in cross section to much larger sizes and in lengths from a few feet up, enter the chipper, they are driven forcibly against the vertical sidewall of the discharge section 20 and the anvil wall 27 of the chipper. As was mentioned before, the discharge feeder section 20 extends into the infeed spout 21 of the chipper and conforms quite closely in shape to the infeed spout. It is resiliently mounted so that it may yield until the adjacent face of the anvil 27 serves as a backstop for the discharge section 20 when the chipper knives engage a heavy piece of wood or timer. The resilient mounting of the discharge section comprises bolts 30 inserted through flanges 31 of the trough sections and rubber bushings or washers 32 separating the flanges. The rubber bushings or washers allow sufficient flexibility so that the discharge section 20 may easily yield within the limits of the infeed spout to the force of the wood timbers being chipped and yet provide sufficient stiffness longitudinally of the feeder to vibrate at full stroke with the adjacent sections of the feeder trough 1 to feed small pieces of wood all the way into the chipper blades without leaving any dead spots.

As may be seen particularly in FIG. 4, the conveyor-feeder trough 1 is preferably generally U-shaped in cross section having a relatively narrow flat bed such as the perforated section

14 and inclined upwardly diverging sidewalls comprising lower sections 35 and upper sections 36. The inclined upwardly diverging sidewalls, in cooperation with the relatively narrow flat bottom section of the conveyor trough, provide a self-cleaning action that is effective in preventing any tie-ups or jams when the scrap lumber to be chipped is dumped into the input section of the conveyor trough in random orientation. The vibratory action combined with the shape of the trough causes the pieces of scrap lumber to orient themselves longitudinally of the trough so that they proceed along the trough in orderly fashion and flow smoothly through the discharge portion 20 and into the chipper 22.

As mentioned previously, the feeder trough 1 is subjected to large shock forces particularly when large heavy pieces of timber are dropped into the loading section and when the large heavy pieces are engaged by the chipper knives. For reliable trouble-free operation, the supports for the vibratory trough must be able to withstand such forces without overstressing the adjacent portions of the conveyor trough, the base, or the supports themselves. In the improved feeder structure of the invention, this is accomplished by carrying the feeder trough by means of the rubber bushed rocker arm assemblies 3 which guide the trough in a particular inclined vibratory motion and by the rubber shear spring assemblies 4 that resiliently support the trough for relatively free vibratory motion in the desired direction of vibration. The desired vibrating motion causes shear deflection of the rubber blocks of the shear spring assemblies while laterally directed forces are resisted, at a higher spring rate, by compression of the rubber blocks. The rocker arm assemblies 3, as shown in FIG. 1 and in the lower left portion of FIG. 4, comprise rocker arms the ends of which are fitted with rubber bushings, not shown, that fit over pins 40 mounted in angle iron clips 41 attached to the base 2 and conveyor trough supports 42.

The rubber shear spring assemblies, also used in pairs, each comprises rubber blocks 45 located on either side of a plate 46 attached to and depending from the conveyor-feeder trough 1. The rubber blocks 45 are compressed between a pair of channel iron side plates 47 by means of a tension bolt 48 passing through holes in the rubber blocks and a clearance hole through the plate 46. The tension bolt 48 also passes through a sleeve 49 serving as a spacer to limit the compression of the rubber blocks 45. Locator rings 50 welded to the sides of the channel iron side plates 47 and the plate 46 fit within the holes in the rubber blocks 45 to hold the blocks in position.

As shown in FIG. 4, the channel iron side plates 47 are bolted directly to the adjacent portions of the base 2 thus forming a rugged resilient connection between the conveyor trough 1 and the base 2.

This preferred apparatus provides means for unscrambling randomly supplied loads of scrap lumber, separating debris from the scrap in a screening section, inspecting it for tramp metal, and finally feeding it into a chipper throat without leaving any gaps or areas where odd pieces of lumber may lodge. The construction provides that the heavy shock forces on the wood being chipped are taken by a portion of the conveyor feeder backed up by the heavy chipper housing and anvil as well as providing a rugged resilient support for the conveyor trough to withstand externally applied forces without producing excessive concentrated stress in the structure. Thus the apparatus is virtually free of maintenance or necessity of attendant supervision while in operation.

The foregoing specific description is illustrative only and various modifications may be made without departing from the scope of the claims.

We claim:

1. A vibratory feeder and chipper for reducing scrap lumber to chips comprising:
   a. a chipper having an infeed spout;
   b. a substantially horizontal vibratory trough of substantial length having a discharge end that extends into the infeed spout of the chipper adjacent to the anvil of the chipper;
   c. rugged resilient means stressed in shear for supporting said trough for vibration in a vertical plane and stressed in compression for resisting lateral forces applied to said trough;
   d. means for guiding said trough along an inclined path in the plane of vibration; and
   e. drive means for reciprocating the trough along the inclined path.

2. A chipper feeder according to claim 1 in which the rugged resilient means comprises blocks of elastomer material compressed between generally flat surfaces of a first member on the trough and second members attached to a support, the surfaces extending parallel to the path of vibration of the trough.

3. A chipper feeder according to claim 1 in which the rugged resilient means comprise blocks of elastomer material compressed between generally flat vertical surfaces of the trough and a base extending parallel to the length of the trough.

4. A chipper feeder according to claim 1 in which the trough is divided into sections, one of which is adjacent the chipper, and a resilient connection between the section adjacent the chipper and the next preceding section of the trough.

5. A chipper feeder according to claim 1 in which at least a portion of the trough bottom is perforated.

6. A chipper feeder according to claim 1 in which the trough comprises at least one section of nonmetallic material to accommodate a metal detector apparatus.

7. A chipper feeder according to claim 1 in which the discharge end of the trough is resiliently attached to the preceding section of the trough and projects into the associated chipper infeed spout.

8. A chipper feeder according to claim 7 in which the discharge section includes a substantially vertical face adapted to absorb the lateral forces exerted by material entering the chipper.