United States Patent

[11] 3,583,312

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[73] Assignee **Lummus Cotton Gin Company**

[54] **FIBER COLLECTION SYSTEM WITH MEANS TO REDUCE CONTAMINATION OF FIBER AND LOSS OF FIBER**
13 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **100/90,** 100/215, 100/220
[51] **Int. Cl.** **B30b 9/00**
[50] **Field of Search** 100/90, 69, 102, 215, 220

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ABSTRACT: Apparatus for collecting fibrous material preparatory to baling including fiber feeding, fiber collection and fiber discharging means so designed as greatly to reduce the contamination and loss of the fiber during the process. Specifically, the fiber is fed to a support member located alongside the charging or collection chamber where streams of air lift and move the fiber from the support thereby to deliver the fiber into the charging chamber. The chamber, near the place where the fiber is fed thereinto, is provided with a perforated section through which the carrier air for conveying the fiber is removed and which prevents loss of fiber. The interior of the apparatus is maintained under subatmospheric pressure. Fiber holding dogs are provided with cover plates to seal about the openings in the sides of the chamber when the dogs are in fiber holding position, during the packing operation. Certain moving relatively slideable portions of the packing means are continuously subjected to downwardly moving currents of air to prevent accumulation of fiber thereon.

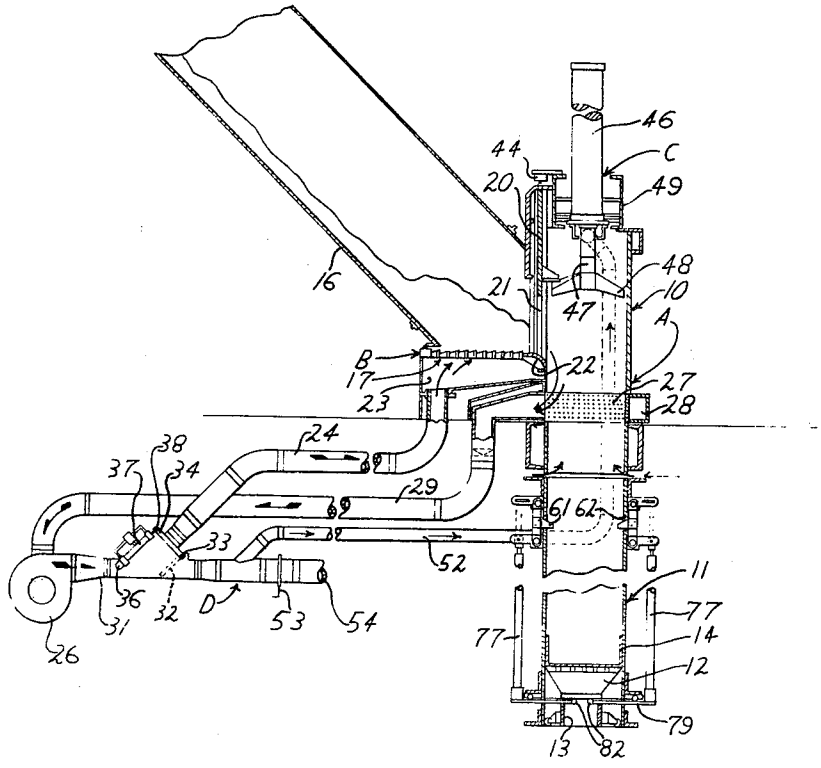


FIG 1.

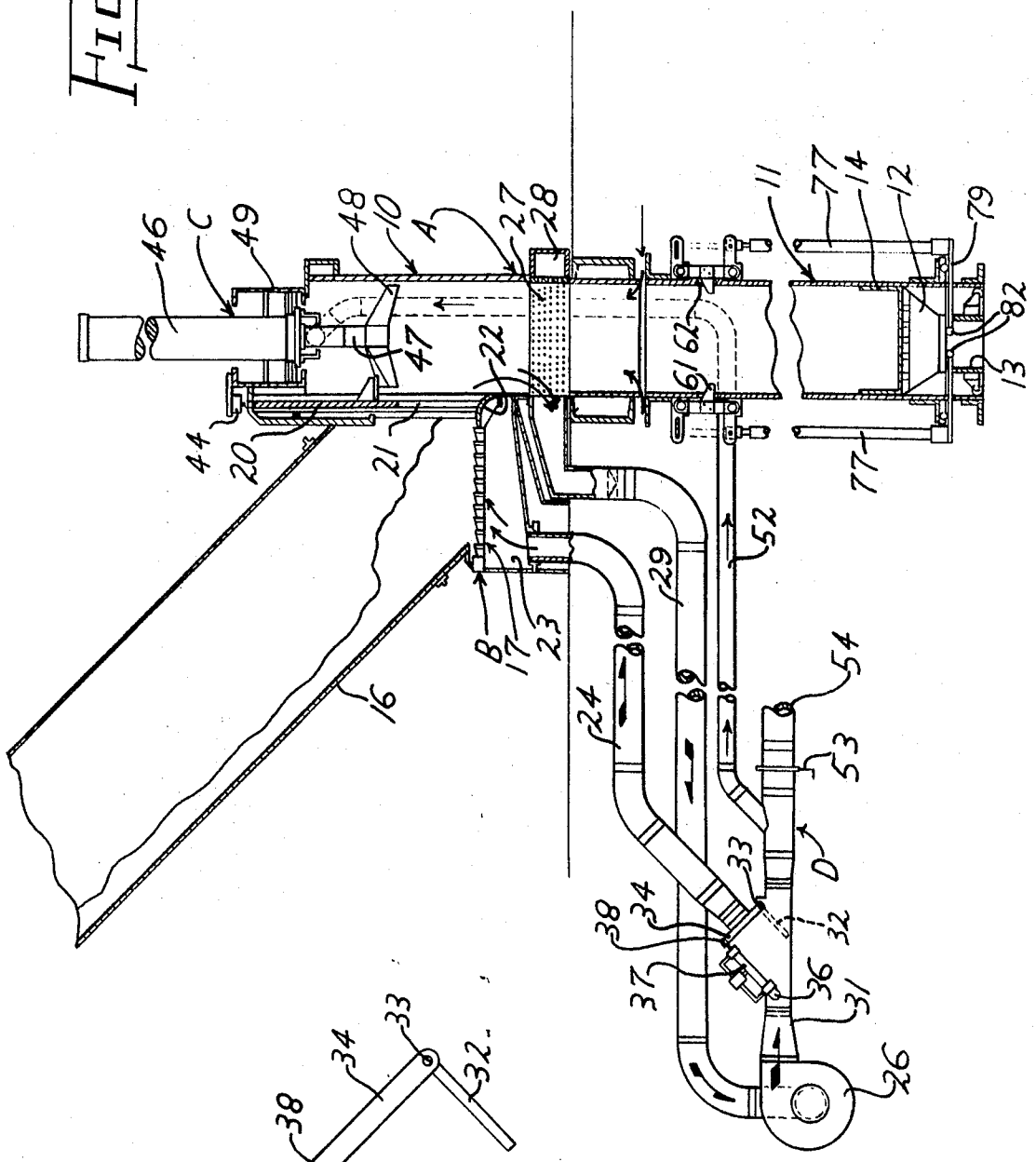
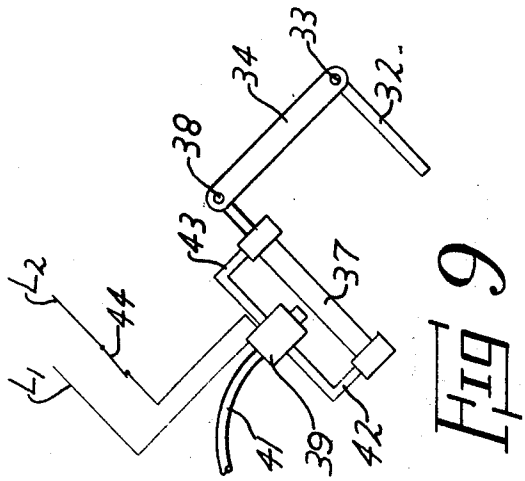


FIG 9



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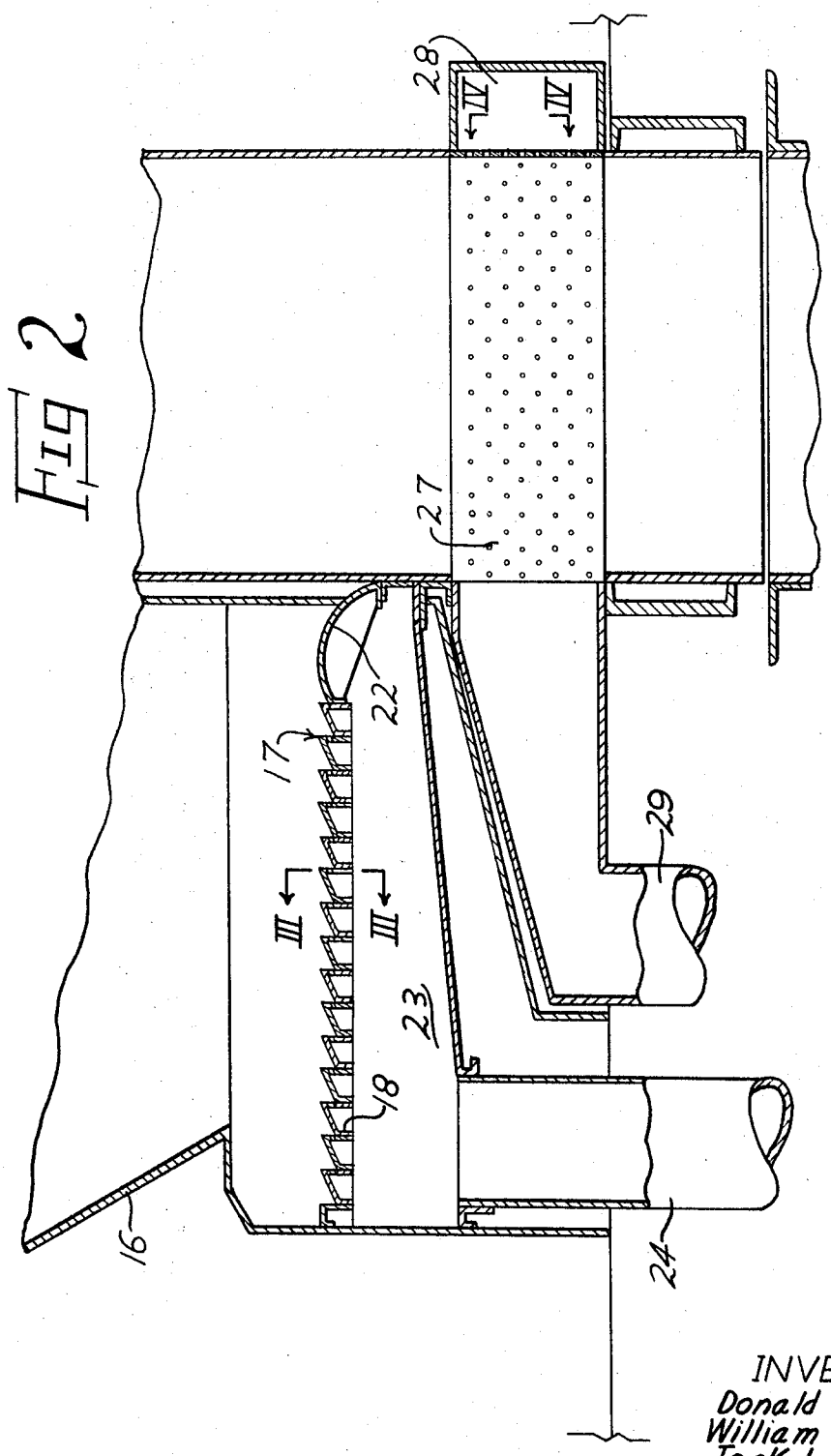


FIG 2

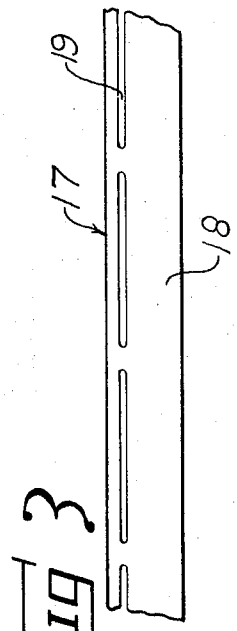


FIG 3

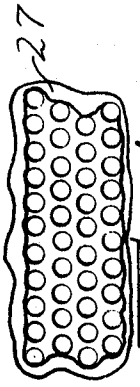
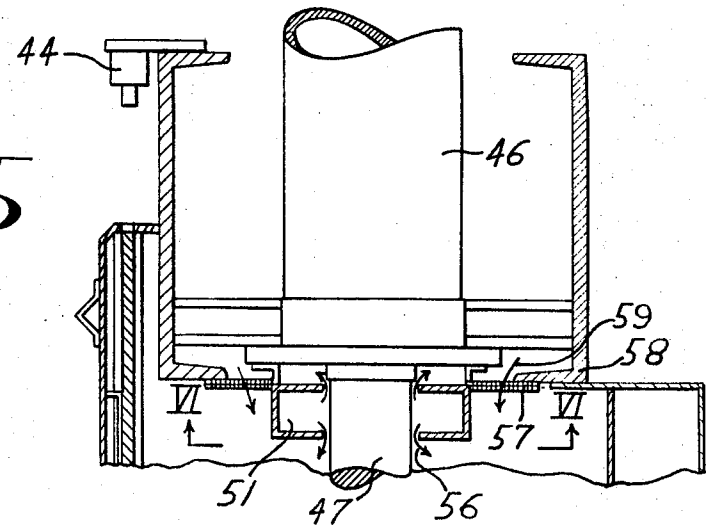


FIG 4

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FIG 5



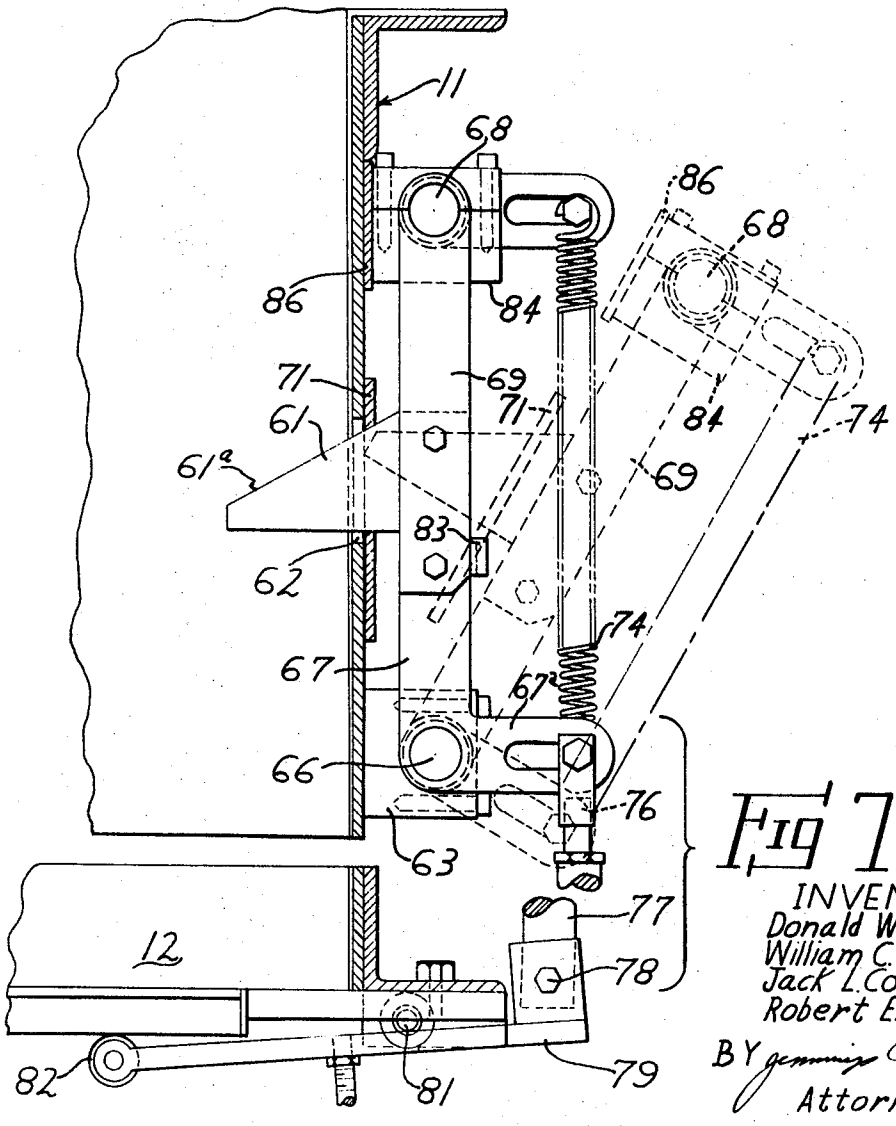


FIG 7

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FIG 8

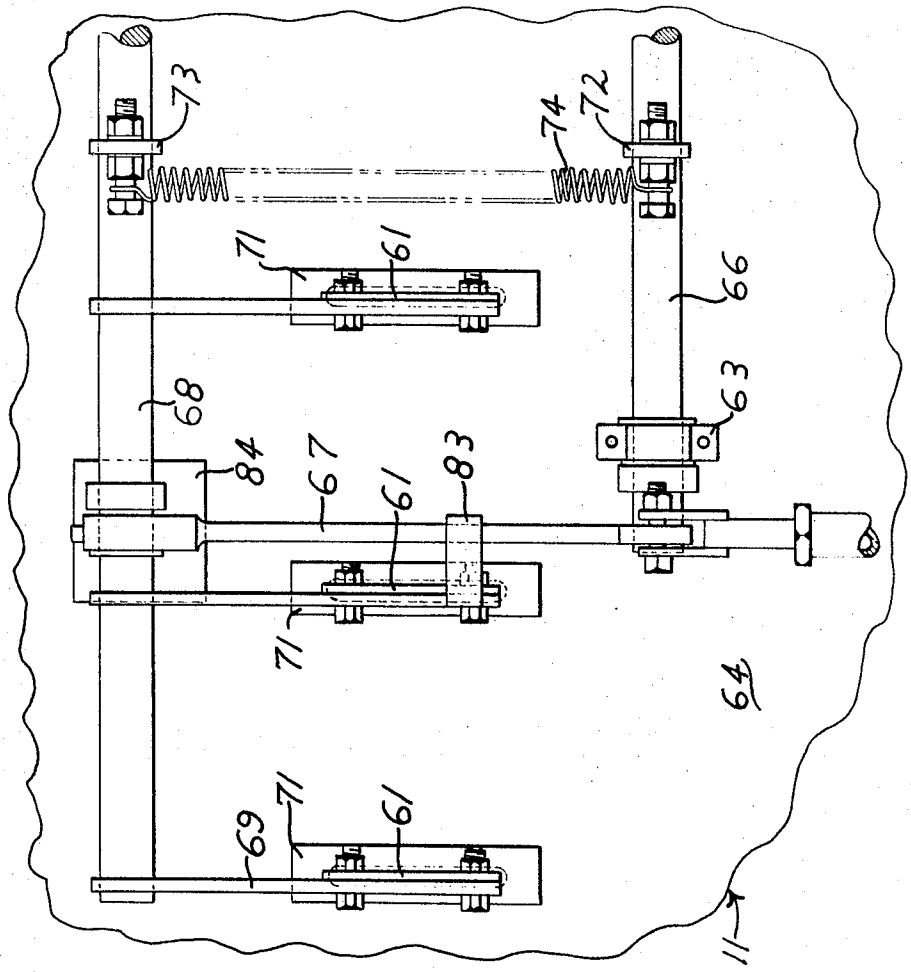
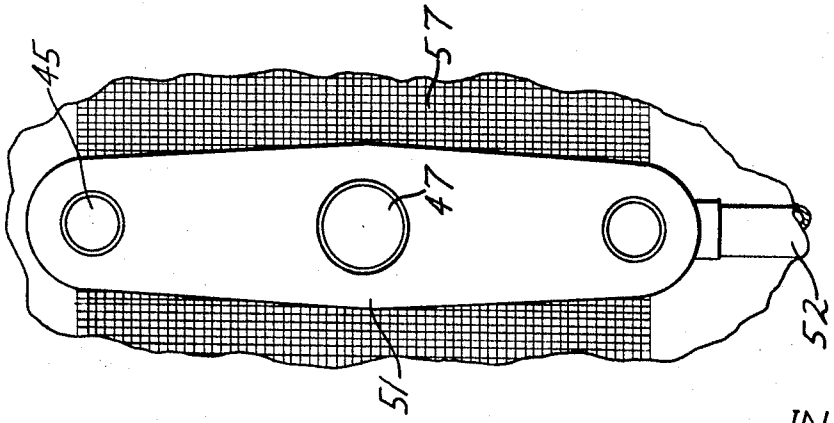


FIG 9



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FIBER COLLECTION SYSTEM WITH MEANS TO REDUCE CONTAMINATION OF FIBER AND LOSS OF FIBER

Our invention relates to a system for collecting fibers preparatory to baling the same.

In the art to which our invention relates it has long been customary to collect fibers as by means of a condenser of the like and to feed these fibers into a fiber collection chamber prior to applying the final compression which forms the fibers into the finished bale. Such prior apparatus has been characterized by contamination of the fiber, damaging of the fiber due to the mechanical feeding means which causes twisted bunches of the fibers and loss of fibers through openings in the apparatus and due to the packing member and compressing member moving air about in the chamber. As is known, when the fibers are to be packed into a charging chamber by apparatus such as a tramper, the chamber is provided with holding dogs so that the fiber pushed into the lower part of the collecting chamber is held by such dogs until a ram or the like moves the follow block upwardly or downwardly, thereby to force the fibers into final compression. These holddown dogs are mounted for movement into and out of slots in the sidewalls of the chamber and heretofore a great deal of fiber has been lost through such openings during filling of the chamber. Further, in prior apparatus of this general type there has been contamination of the fibers due to the same collecting on the piston rods and other moving parts of the apparatus. There has been a considerable loss of fiber through various necessary openings in the apparatus.

In view of the foregoing an object of our invention, broadly stated, is to provide apparatus of the character designated in which means is provided to prevent contamination of the fibers and loss thereof during accumulation of the fibers in the charging chamber and to provide improved means for delivering the fibers to the chamber.

More specifically, our invention contemplates an improved means for delivering fibers to the chamber during those times when the tramper or other packing apparatus is in or near its uppermost or raised position, which means consists essentially of a unique pneumatic lift and shifting means for moving the fiber from a collection point near the chamber to the inside of the chamber.

Another object is to provide, in apparatus of the character designated, means to remove the carrier air used to deliver the fiber to the chamber and at the same time to screen out of such air any loose fiber or fly which otherwise would go out with such air.

Another object of our invention is to provide air feed means for fiber as indicated above together which mechanism which automatically shuts off the supply of air for such fiber delivery purposes when the packing mechanism is on its downward stroke.

Another object is to provide apparatus in which the interior of the charging chamber is maintained under subatmospheric pressure during the time that the fiber is being collected therein and to accomplish the foregoing, as well as moving air downwardly about the piston rod or other reciprocating members of the tramper, by a single air blower or the like.

A further object is to provide the fiber holddown dogs with cover plates which seal about the openings in the sidewalls of the chamber during those times when they are holding the fiber which has been packed therebeneath.

Our invention further contemplates an improved means for mounting and operating the holddown dogs which allows the above-mentioned cover plates to be used, namely, apparatus in which the dogs are free to move outwardly without interference with the cover plates upon downward movement of the tramper and which return to their fiber holding position due to a spring biasing of the same, and yet, which automatically are withdrawn from the chamber without interference with the cover plates responsive to upward movement of the fiber final compression apparatus such as a lower platen which is moved upwardly by a ram or the like.

Apparatus illustrating features of our invention is shown in the accompanying drawings, in which:

FIG. 1 is a somewhat diagrammatic, detail sectional view, with parts partly broken away and in section, and illustrating our improved system;

FIG. 2 is an enlarged detail sectional view through a portion of the apparatus to illustrate the means for delivering the fiber into the chamber;

FIG. 3 is a detail, enlarged sectional view taken generally along line III–III of of FIG. 2;

FIG. 4 is a fragmental, enlarged detail sectional view taken generally along line IV–IV of FIG. 2 and illustrating a surface of the perforated metal section through which the carrier air is removed;

FIG. 5 is an enlarged detail fragmental sectional view of the upper end of the chamber and illustrating the method of circulating air about the piston rod of the tramper;

FIG. 6 is an enlarged detail sectional view taken generally along line VI–VI of FIG. 5;

FIG. 7 is an enlarged detail fragmental view of the lower end of one of the operating mechanisms for one set of holddown dogs;

FIG. 8 is a side elevation view of a portion of the dog support mechanism shown in FIG. 7, this FIG. showing only one-half of a complete set of the mechanisms; and

FIG. 9 is a schematic diagram illustrating the means for controlling the operation of the air control valve.

Referring now to the drawings for a better understanding of our invention we show the same as embodying a fiber collection chamber indicated generally at A in FIG. 1, a fiber delivering means indicated generally at B, a tramper indicated generally at C and means, including a blower, and ducts for supplying air to the fiber delivery means and for maintaining the inside of the chamber under subatmospheric pressure, all generally indicated by the letter D.

As will be understood, the charging box A may embody a stationary upper portion **10** and a lower portion indicated generally at **11** which may be placed beneath the upper portion **10** to receive the fiber and then, by means not shown, rotated to a position beneath a press box, also not shown, to receive the fiber. Thus, in the lower section **11** there may be a follow block or platen **12** which, by a ram which may enter the opening **13**, is moved upwardly when the lower portion of the box is filled with fiber, thus to move the fiber upwardly and compress it into the press box for baling. We illustrate at **14** an open ended, lower portion of a carton which has been placed on top of the platen **12**, prior to placing any fiber in the box and which may be used in connection with an upper section of a carton placed within the press box, not shown, to enclose the fiber in bale form.

The fiber indicated at F is delivered to our improved apparatus through a downwardly inclined chute or slide **16** from a condenser or other accumulating means or source, not shown. The fiber is delivered by the slide onto a substantially horizontal, shelflike structure **17** illustrated more particularly in FIG. 2 and which may comprise a plurality of individual channel like sections **18**. The upper, forwardly projecting edges of the sections **18** each project above the rear lower ends of the adjacent section, in steplike fashion. The edges so projecting are provided with openings **19** as shown in FIG. 3 through which air may be delivered as will be explained, thus pneumatically to lift and laterally move the fiber off the support and into the chamber.

The chamber A is provided with an opening **21** through a sidewall thereof located at the discharge side of the shelflike support section **17**. A transition plate **22**, curved as shown in FIG. 2 is adapted to evenly convey the fiber off the delivery end of section **17** so that it drops downwardly into the collection chamber. This curved plate reduces turbulence of air flowing from the feeder to the scavenger, as will appear. Also, and as customary in the art, the opening **21** may be closed by a sliding door **20** whenever the operating portion of the tramper C is in downward position as will later appear. That is to say, on each downward packing movement of the tramper C door **20** is lowered into position to close opening **21**.

Located beneath the shelf like section 17 is a plenum chamber 23. Air under pressure is supplied to the plenum 23 through a conduit 24 from a blower 26. Thus, when the tramper is in raised position and as will appear as the description proceeds, air is supplied through the conduit 24 to the plenum 23 and passes out through the openings 19, thereby to raise and laterally move the fiber thereon through the opening 21 where it falls by gravity into the lower portion of the chamber. The tramper then starts its downward stroke, whereupon the door 20 closes the opening 21 and the fiber is packed and held by certain holding dogs as will later appear.

In order to remove from chamber A the carrier air delivered through the conduit 24, we provide a perforated section 27 for the upper part 10 of the chamber. This perforated section is located beneath the transition plate 22 and is surrounded by a bustle pipe 28. The bustle pipe 28 is connected to a conduit 29 which leads to the intake side of the blower 26 so that air required by the blower is drawn through a perforated section 27. By way of example, the section 27 may be a smooth metal plate with 1/16 diameter holes located on ⅛ inch centers as shown in FIG. 4.

It will be noted that the conduit 24, leading from the outlet side of fan 26, is connected thereto by a conduit 31. At 32 we show a valve pivoted at 33 and which has an operating member 34 secured thereto. Pivotally mounted at 36 is an air cylinder 37 having its piston rod connected at 38 to the other end of arm 34. Cylinder 37 is double acting and is under control of a solenoid operated valve 39. Thus, air under pressure from a source not shown may be supplied to the valve 39 through a conduit 41. With the value 41 in one position air is supplied to the cylinder 37 through line 42, thus to move arm 34 and hence valve 32 about pivot point 33 from the position shown in the drawings to a position to close conduit 24. On the other hand, when air is supplied to line 41 through conduit 43, the value is maintained in the position shown in FIG. 1, that is, with conduit 24 full open and with a small amount of air passing around the valve 32 to exhaust, for a purpose presently to appear.

The valve 39 is under control of electric switch 44 located in position to be closed when a movable portion of the tramper is in raised position. The switch 44 is spring biased toward open position, whereby upon downward movement of the tramper parts, the switch opens and cylinder 37 is energized to hold valve 32 in the position illustrated in FIG. 1.

The tramper C embodies a fluid pressure cylinder 46, a piston rod 47 and a tramper foot 48. The cylinder is supported by suitable framework 49 over the upper portion 10 of chamber A. The tramper is operated in ordinary fashion, that is, intermittently, whereby the tramper foot 48 moves downwardly to pack the fiber delivered through the opening 21 into the bottom section 11 of the chamber.

Referring particularly to FIG. 5 it will be seen that around the piston rod 47 for the tramper we provide an elongated plenum 51. Air from the exhaust side of the blower 26 is delivered continuously to plenum 51 through a conduit 52, there being an adjustable plate valve 53 in line 31 which regulates the amount of exhaust air from the fan which goes to exhaust through the conduit 54, thereby to determine the volume delivered to line 52. Thus, the plenum 51 is so designed that at all times during operating of the apparatus streams of air illustrated by the arrows 56 flow around the moving piston rod 47, thus to prevent fiber from accumulating thereon. Further, we provide a screen section 57 which surrounds the plenum and the adjacent supporting structure 58 so that during operation there are downwardly moving streams of air entering the screen as illustrated by the arrows 59. Such air may be that portion thereof which moves out through the top openings of the plenum 51, adjacent the piston 47 and rods 45 and any other air which may leak through the apparatus at that point.

From what has been described it will be seen that with the apparatus in operation and with the blower connected as shown, fiber fed onto the slide 16 comes to rest on the air lifting and feeding section 17. With the tramper foot 47 in the raised position door 20 is held in upward, open position, thus to open the feed opening 21. Since the valve 32 is in the position shown in FIG. 1, because switch 44 is open, air is supplied through the conduit 24 to plenum 23 where it engages through the openings 19, thus to lift and laterally shift or move the fiber from the support 17 where it falls through openings 21 and into the collection chamber. The tramper foot 48 now moves downwardly, closing door 20 and also moving valve 32 from the position shown to a position to shut off the flow of air to conduit 24. During each downward movement of the tramper the perforated section 27 is wiped, removing all fibers that might be clinging thereto and carrying them into the lower portion of the chamber. During all this time the intake side of the blower is drawing air through the conduit 29 and is supplying air to the top plenum 51. The interior of the entire chamber thus is maintained under subatmospheric pressure. In practice we find that very little subatmospheric pressure is necessary to prevent loss of fiber and to keep the moving parts clean. Less than one inch, watergauge is entirely sufficient and imposes very little load on the blower. As the tramper moved downward fiber is packed in the lower portion 11 and is held down by the holddown dogs presently to be described and the fiber is thus built up and somewhat packed, though in relatively loose form, in the bottom portion 11 of the chamber. When sufficient fiber is collected in this portion of the chamber to form a bale of desired weight bottom portion 11 is shifted from beneath the portion 10 to lie beneath a baling press, not shown, and then, by mechanism not shown and not important to this disclosure, but which essentially is a ram, the follow block or lower platen 12 is raised upwardly to push the whole mass of fiber into the bailing press and compress in therein into bale form.

In order to hold the relatively loose fiber, which has been packed by the tramper 48, in the lower part 11 of the chamber, we provide holddown dogs 61. As shown, there are sets of these dogs on opposed sidewalls of the lower part of the chamber 11. In view of the fact that the sets on both sides of the chamber are duplicates a description of one will suffice for both. Also, FIG. 8 shows only about one-half of a complete set as the chamber A is viewed from the side, the vertical centerline of the dog assembly passing about through the lugs 72 and 73 presently to be described.

Each individual dog 61 is disposed to move into and out of a slot 62 in the sidewall of the chamber both when the tramper moves downwardly to pack the fiber in the chamber and when the follow block is moved upwardly to compress the fiber in the bailing press. With each downward movement of the tramper 48 the dogs must be moved outwardly by the fiber and then moved back in, in order to keep the fiber from springing upwardly. When bailing the dogs must be completely withdrawn.

Mounted in a suitable bearings 63 secured to the sidewall 64 of the lower section 11 of the chamber is a shaft 66. Secured to the shaft 66 is an arm 67 which has an angle portion 67*a* extending therefrom. The upper end of the arm 67 is rotatably mounted in another shaft 68.

The dogs 61 are secured to arms 69 in turn welded or otherwise made fast to shaft 68. As shown particularly in FIG. 7, cover plates 71 are associated with each dog in such manner that when the dogs are in their inward positions the cover plates 71 seal and exclude the ingress of air through the slots 62.

Outstanding from the shaft 66 is a lug 72 and outstanding from shaft 68 is a similar lug 73. A tension spring 74 has its ends anchored as illustrated to the lugs 72 and 73.

Secured to the outstanding section 67*a* of arm 67 is the upper end 76 of a connecting link rod 77. The rod 77 is connected at 78 to the end of a rock bar 79 pivoted at 81 beneath the lower, open end of the chamber section 11. The end 82 of the rod 79 is adapted to be engaged by the follow block 12 so that whenever the follow flock 12 is in its lower position, that is, while the chamber is being filled with fiber, the rod 77 is held in its uppermost position.

With the dog mechanism in the position illustrated in the drawings, it will be seen that with each downward movement of the tramper foot 48 the down moving fiber is free to force the dogs 61 outwardly, due to the inclined surfaces 61*a*, this action being permitted by the rotation of shaft 68 in the upper end of the arms 67. Under these conditions shaft 66 and arm 67 remain in the positions illustrated in FIGS. 7 and 8 only the dogs and their supporting arms 69 move outwardly. The fiber is thus free to be packed beneath the holddown dogs and as soon as the tramper withdraws the dogs are forced back inwardly due to the inward biasing effect of spring 74.

When the lower portion of the chamber has been filled with fiber and the chamber is shifted to a position beneath the press, upward movement of the follow block or platen 12 relieve the downward pressure of the end 82 of arm 79. When this occurs the weight of the relatively long linkage 77 causes rotation of the entire dog assembly about the shaft 66. In other words, when linkage 77 moves downwardly, due to its weight, shaft 66, being secured to arm 67, is rotated clockwise as shown in dotted lines, FIG. 7. Due to the provision of a lug 83 on one of the dog arms 69, pivotal, outward movement of arm 67 engages such lug. Since all of the arms 69 are welded or otherwise secured to shaft 68, as soon as the side of arm 67 engages the inner surface of lug 83, the entire upper assembly including shaft 68 moves away from the side of the box, thus withdrawing the dogs 61 and permitting the fiber to be moved upwardly for baling. A block 84 having a pad 86 of resilient material may be provided on shaft 68 to absorb shock on return of the upper assembly.

In view of the foregoing it will be seen that we have devised an improved system for handling fibers for bailing purposes. By "contamination" we means contamination from grease, foreign matter, and the like which is present on substantially all moving parts such as chains, conveyors and the like. Further, we intend to employ the word as meaning the twisting, nepping, crushing, fusing together and other damage to fibers due to mechanical working. Therefore, when we say that out apparatus reduces contamination of fibers we use that word as just defined.

With the system in operation it will be apparent that at all times, whether the tramper foot is stationary or is moving up or down, suction is being applied to the interior of the chamber. This maintains a slight, less than one inch, water-gauge, subatmospheric pressure therein. Fiber which otherwise would be lost through the various cracks and openings in the apparatus are effectively held inside the system due to atmospheric air entering the various openings. Since the return air goes through screen 27, the fibers collect thereon and each time the tramper foot moves downwardly the fibers clinging thereto are carried along with the main body of fiber. By continually moving air downwardly about the foot of the tramper we keep these parts as clean as possible. Further, we prevent fiber from accumulating thereon which absorbs oil and then, eventually, drop off into the main body of the fiber thereby to contaminate it in a serious way. By valving the conduits as illustrated we are enabled to employ a single fan pneumatically to convey the fiber into the changing chamber and to maintain it under subatmospheric pressure as well as to supply scavenging air to the plenum 51. By closing the openings around the dogs we further eliminate a source of difficulty both with respect to losing fiber and maintaining the chamber under negative pressure.

In practice our invention has proven to be extremely satisfactory and practical. While we have shown our invention applied to an up packing, single box press, it is equally applicable to a down packing press having either single or double boxes.

While we have shown our invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

What we claim is:

1. A fiber collecting system characterized by a major reduction in the contamination of the fiber collected therein and loss of fiber therefrom comprising:
   a. a fiber collecting chamber,
   b. means to introduce fiber into the chamber,
   c. a reciprocating packing member operable in the chamber, and
   d. means to maintain the interior of the chamber under subatmospheric pressure during the compaction stroke of the packing member.

2. A fiber collection system characterized by a major reduction in the contamination of the fiber collected therein and loss of fiber therefrom comprising:
   a. a vertically elongated fiber collection chamber,
   b. a reciprocable packing member operable within the chamber to pack the fibers therein,
   c. means to introduce fiber into the chamber at a point between the ends of the path of travel of the packing member comprising,
      1. a support onto which the fiber is delivered, and
      2. means to direct lateral streams of air under superatmospheric pressure through the support and onto the fiber resting thereon, whereby the fiber is moved solely by said air streams from the support into the chamber, and
   d. means to maintain the interior of the chamber under subatmospheric pressure during the compaction stroke of the packing member.

3. In fiber packing apparatus,
   a. an elongated vertical fiber receiving chamber,
   b. a fiber packing member mounted adjacent the upper end of the chamber and having a packing member adapted to reciprocate vertically, thereby intermittently to pack in the lower part of the chamber charges of fiber delivered to the chamber,
   c. fiber holding dogs pivotally mounted to opposed sides of the chamber at a point intermediate its ends, said dogs having fiber engaging ends projecting through slots in the walls of the chamber,
   d. means to deliver fiber through a wall of the chamber located above the dogs and at a lower point on the chamber than the packer member when in retracted position comprising,
      1. a support member for the fiber,
      2. a valve controlled supply of air directed through said support and laterally thereof toward the chamber, thereby to move the fiber from the support into the chamber,
      3. control means effective during the packing stroke of the packing means to stop the flow of said air, thereby to stop delivery of fiber from said support into the chamber,
   e. there being a perforated wall section of the chamber adjacent the point where the fiber is introduced thereinto, and
   f. means to draw air from inside the box through said perforated wall section thereby to maintain the interior of the chamber under subatmospheric pressure.

4. Apparatus as defined in claim 3 in which there is means to maintain a flow of air around the moving portion of the packing member, thereby to reduce the accumulation of fiber on said member.

5. Apparatus as defined in claim 4 in which the means to supply air to said support member and the means to maintain the interior of the chamber under subatmospheric pressure comprises a single air moving apparatus.

6. For use with a fiber baling system of the kind having a fiber collection chamber which includes reciprocable apparatus for packing fiber in the chamber and other reciprocable apparatus for upwardly compressing the fiber,
   a. a fiber holddown dog having a fiber engaging end disposed to project removably through an opening in the sidewall of the chamber,

b. means resiliently biasing said dog inwardly of the chamber,

c. means pivotally mounting said dog for movement outwardly of the box upon reciprocation of the fiber packing apparatus on its fiber packing stroke,

d. means mounting said dog for substantially complete withdrawal from the chamber in response to reciprocation of the upwardly compressing apparatus, and

e. a cover member movable with the dog and adapted when the dog is in its inner position to seal about the opening in the chamber through which the dog moves, thereby to prevent ingress or egress of air into or out of the chamber.

7. Apparatus as defined in claim **6** in which said dog is carried by an arm located on the outside of the chamber,

a. a first shaft to which said arm is nonrotatably secured,

b. a second shaft pivotally mounted on the side of the chamber,

c. a second arm connecting both of said shafts,

d. means resiliently biasing the first shaft in a direction to urge said dog into the chamber, and

e. means operatively connecting said second shaft and said reciprocable fiber upwardly compressing means, whereby upon reciprocation of the fiber packing means said dog is moved out of the chamber against the force of said resilient means by rotating about said first shaft, and upon upward movement of the fiber upwardly compressing means said dog is withdrawn from the chamber upon rotating about said second shaft.

8. In fiber packing apparatus,

a. a fiber collecting chamber,

b. a reciprocating fiber packing member,

c. an arm attached to said packing member that enters said chamber at one end, and

d. means to cause superatmospheric air to blow into the chamber around said arm adjacent the point where the arm enters the chamber.

9. Apparatus as defined in claim **8** in which the fiber collection chamber is provided with means to remove air from the chamber during the compaction stroke of the packing member and having associated filter means to contain the fiber within the chamber as said air is removed.

10. Apparatus as described in claim **9** in which the means to cause air to blow into said chamber and means to remove air from the chamber uses a common air propelling means.

11. A fiber collection system characterized by a major reduction in contamination of the fiber collected therein and loss of fiber therefrom comprising:

a. a vertically elongated fiber collection chamber,

b. a reciprocable packing member operable within the chamber to pack the fibers therein and comprising the piston rod of a fluid pressure cylinder,

c. means to maintain a flow of air around the piston rod, thereby to reduce the accumulation of fibers on said rod as it reciprocates,

d. means to introduce fiber into the chamber at a point between the ends of the path of travel of the packing member comprising,

1. a support onto which the fiber is delivered, and

2. means to direct lateral streams of air through the support and onto the fiber resting thereon, whereby the fiber is moved by said air streams from the support into the chamber.

12. In fiber packing apparatus,

a. a fiber collecting chamber having a fiber entry on one side,

b. a reciprocating fiber packing member including an arm that passes through a wall of said chamber,

c. a fan,

d. means to direct a portion of air discharging from the fan to blow into said chamber around said arm adjacent the point where said arm passes through said chamber wall, and

e. air from said fan being directed to blow air into said chamber entry to convey fiber into the chamber.

13. A fiber collection system characterized by a major reduction in the contamination of the fiber collected therein and loss of fiber therefrom comprising:

a. a vertically elongated fiber collection chamber,

b. a reciprocable packing member operable within the chamber to pack the fibers therein,

c. means to introduce fiber into the chamber at a point between the ends of the path of travel of the packing member comprising,

1. a support onto which the fiber is delivered,

2. means to direct lateral streams of air through the support and onto the fiber resting thereon, whereby the fiber is moved by said air streams from the support into the chamber, and

3. a curved transition piece located at the juncture of said support and said collection chamber, the curvature of which is sufficient to cause smooth deposition of the fiber in said chamber.