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GRAIN DRIER

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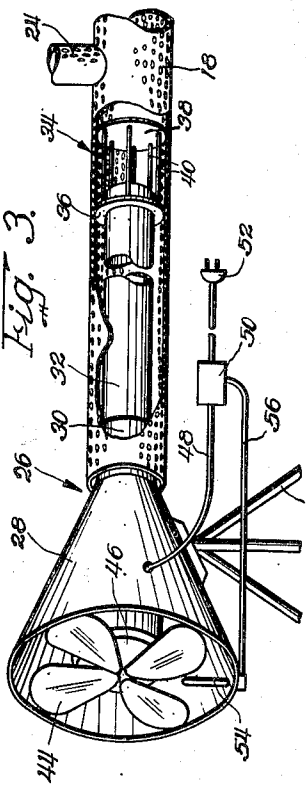
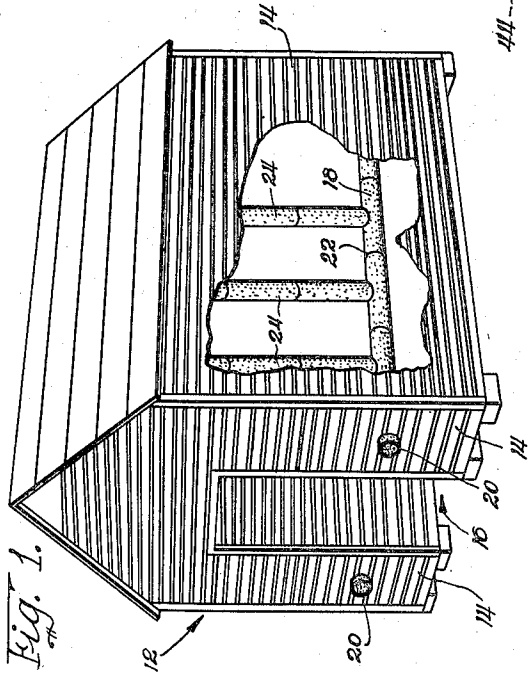
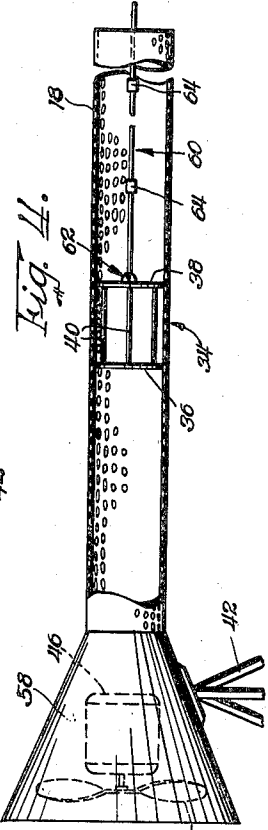


Fig. 5.

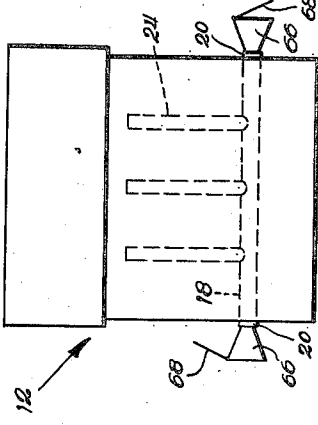


Fig. 6.

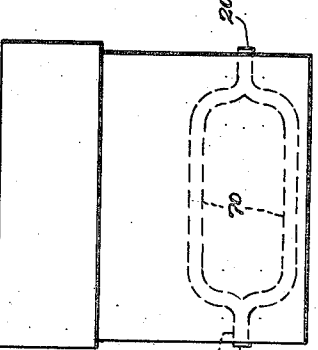
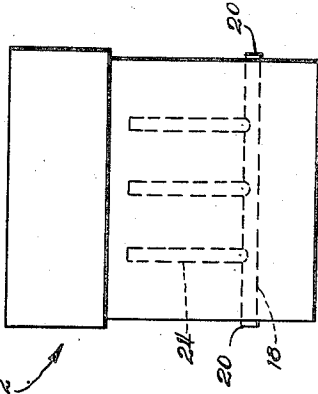


Fig. 2.



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## GRAIN DRIER

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7 Claims. (Cl. 98—55)

1

The present invention relates to a drier for corn cribs, grain bins, etc., and is adapted for drying corn, small grain and hay.

The construction of the device of the present invention includes perforated tubes which are disposed in the corn crib or space having the material to be dried, and a novel construction which is removable and replaceable with respect to the perforated tubes.

An object of the invention is the provision of novel means for controlling the point from which air is removed from the material to be dried.

Another object is the provision of novel means whereby the air can first be removed from the center of the material to be dried and later from points progressively toward the outside of the material.

A specific object is the provision of perforated tubes as referred to above, and a slidable inner tube having communication with the perforated tube at localized points.

Another object is the provision of such a perforated tube and inner tube in which the inner tube is insertible from either end of the perforated tube.

Still another object of the invention is the provision of a novel arrangement which can be alternately adapted for natural circulation or forced circulation. When forced circulation is no longer desired, a portion of the apparatus is removed and natural circulation continues.

A further object of the invention is the provision of controls for regulating the drying process in which the controls are responsive to climatic conditions.

A still further object is the provision of controls for regulating the apparatus in which the controls are responsive to the condition of the air withdrawn from the material to be dried, and hence responsive to the condition of the material.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, wherein:

Figure 1 is a perspective view of a corn crib having the device of the present invention installed therein with a portion of the corn crib broken away;

Figure 2 is a reduced scale side view of Figure 1;

Figure 3 is a perspective view of a portion of the novel drying apparatus with a portion broken away;

2

Figure 4 is a view similar to Figure 3, showing a modified form of apparatus;

Figure 5 is a reduced scale side view of a modified form of apparatus, and

Figure 6 is a reduced scale side view of a still further modified form.

Referring in detail to the drawing, the reference numeral 12 indicates the corn crib as a whole, which, as is customary, includes two side sections 14 and a central driveway 16. One of the side sections 14 is shown broken away and illustrates a portion of the apparatus of the present invention therein. A horizontal perforated tube 18 is disposed adjacent the bottom of the space in the crib section 14, and mounted so that the ends thereof, as indicated at 20, communicate with the exterior of the crib and may actually project out a short distance. The perforated tube 18 may be observed in greater detail in Figures 3 and 4, and preferably consists of a plurality of sections indicated by dividing lines 22. The sections each have one end slightly flared so that a corresponding end of the next section is adapted to fit thereinto similarly to a stove pipe. The perforated tube 18 is preferably of metal, and the holes forming the perforations therein are, of course, smaller than the size of the kernels of the grain in the crib. The sections of the tube 18 are preferably rigid so that the tube maintains its own shape and position when mounted in the crib.

Extending upwardly from the tube 18 are a plurality of vertical tubes 24 which communicate with the tube 18 and extend to the top of the crib where they may be anchored by any convenient means. The particular size and shape of the tube 18 and the vertical tubes 24 do not constitute an essential part of the present invention, and they may be of any size and proportions having the capacity to carry the desired amount of air therethrough.

In the preferred form of the device of the present invention (Figure 3) is shown an insert indicated generally at 23. The insert includes a funnel shaped outer end 28 having a reduced cylindrical portion 30, which is slidable into the end of the tube 18. Secured to the inner end of the cylindrical portion 30 is a flexible tube 32 which may be of rubber or rubber composition or other desired material. The tube 32 which may also be termed an inner tube, is imperforate, having its inner end open.

Mounted on the inner end of the inner tube 32 is a cage, referred to generally at 34. The cage 34 includes an annular plate or partition wall 36 fitted on the tube 32 adjacent the inner end of

3

the latter, and another solid plate or partition wall 33 spaced longitudinally beyond the inner end of the inner tube. The two plates 36 and 38 are secured together by a plurality of fingers or bars 40. The plates are both of appropriate dimension as to slidably engage the inner surface of the perforated tube 18, and the annular plate 36 is secured to the inner tube 32 so as to be carried thereby. The plates 36 and 38 segregate a portion of the interior of the tube 18 and the space in this portion communicates with the inner tube 32.

The insert 26 is thus slidable in the perforated tube 18 upon manipulation of the outwardly extending funnel element 28.

The tube 18 is disposed somewhat above the bottom of the floor of the crib, and for the purpose of supporting the funnel element 28, a stand 42 is provided, which supports the funnel element from the ground.

An impeller in the form of a fan 44 is mounted on the shaft of an electric motor 46, both of which are supported in the outer end of the funnel 28 by any convenient means. The wires 48 leading from the motor 46 are provided with a thermostat-humidistat 50 which may be of conventional form and the wires are provided with the usual plug-in element 52. The thermostat-humidistat 50 is disposed in any convenient place on the exterior of the crib so that it is responsive to the ambient air around the crib. A humidistat 54 is mounted in the funnel 28 and extends up into the interior of the funnel adjacent the fan 44, and it may be either immediately ahead of immediately after the fan. The humidistat 54 is connected by means of wires 56 to the thermostat-humidistat 50, and the two instruments are connected in such a way as to control the motor 46 in a manner to be explained later.

Figure 4 illustrates a modified form of device with a perforated tube. The tube 18 is similar to that in the first embodiment, and instead of having a slidable insert therein, a funnel 58 is connected directly to the end of the tube 18. The fan 44 and motor 46 are provided as in the previous embodiment.

A cage is provided in the present embodiment (Figure 4) similar to the first embodiment, the cage being indicated at 34. A pull rod 60 is connected to the plate 38 by a hinged connection 62. The hinge connection 62 may be any conventional hinge construction such as ears mounted on the plate 38 with the pull rod being pivoted therein by a transverse pin. The pull rod 60 is made up of a plurality of separable sections secured together by any convenient means such as screw threaded connections 64. The pull rod 60 extends out the opposite end of the tube 18.

In the embodiment of Figure 4, the tube 18 may be constructed as in Figure 1, and the funnel 58 is detachably connected thereto so that the funnel can be alternately attached to either end of the tube 18.

Figure 5 illustrates the perforated tube 18 arranged similarly to that in Figure 1, and mounted at each end of the tube are funnels 66. The funnels 66 may be permanently secured or they may be detachably secured. Each funnel 66 is provided with a closure element 68 hinged or otherwise mounted so that the respective funnel can be opened or closed as desired.

Figure 6 shows another alternate arrangement of the perforated tube 18. In the present case, the tube 18 has individual branches 70 disposed in vertically spaced relation so that the air with-

4

drawn is withdrawn from spaced points within the crib.

#### Operation

In the device of Figure 3, the insert 26 is moved in the perforated tube 18 a desired extent to position the cage 34 at the point from which it is desired to withdraw air. As is well known, the center of the mass of grain or hay should be dried first and the cage 34 is positioned approximately at the center of the tube 18. The motor 46 is then started and the fan 44 withdraws air through the inner tube 32. The air is thus drawn from the space in the cage 34 which in turn is drawn from the grain through the point in the perforated tube 18 to which the cage is positioned. After it is determined that sufficient air is drawn from that point, the insert is moved outwardly a distance equal to the space between the plates 36 and 38 and air is then withdrawn from a new point.

The insert 26, as determined by the inner tube 32, is preferably approximately one-half the length of the tube 18, and accordingly, can be inserted from either end of the tube 18. After the grain has been dried at one end of the crib, that is, from the center of the tube 18 to one end, the insert 26 is then inserted in the opposite end of the tube 18 and the process repeated.

The thermostat-humidistat 50 is so arranged that the motor 46 is cut off if the temperature of the air is below a predetermined point: For example, a cold air, below 32° F. is not particularly effective for drying grain, and the thermostat is set to cut off the motor when the temperature goes below such a predetermined point. The counterpart of the control 50, namely the humidistat, is set to cut off the motor 46 when the humidity of the air goes above a predetermined percentage. It is obvious that moist air will not withdraw moisture from the grain. The above two conditions, namely the temperature and humidity of the ambient air or the climatic conditions must then be within a certain range for the motor 46 to operate, and it is thus unnecessary for the user to turn the motor off and on, and the action is fully automatic.

The humidistat 54 being disposed in the funnel 28 is responsive to the humidity of the air being withdrawn from the ventilating system. As the grain is being dried, the percentage of humidity in the air withdrawn from the grain drops and after the proper extent of drying is accomplished, the humidistat 54 automatically shuts off the motor. The user then knows that the insert can be readjusted to position the cage 34 at a new point. The controls 50 and 54 while illustrated as being applied to the device in Figure 3 can, of course, be applied to all of the other embodiments.

In the device of Figure 4, the funnel 58 and the motor and fan are stationarily positioned, and the cage 34 is positioned in the tube 18 at any desired point so that the fan 44 will withdraw air from that portion of the perforated tube between the plate 38 and the end of the tube at which the fan is located. The user can set the cage 34 at any desired point, for example, the middle of the tube 18, and gradually adjust it toward the fan so that the space from which air is withdrawn is gradually reduced. In the case of the embodiment of Figure 4, the fan may be positioned at either end of the perforated tube, and the pull rod 60 extended out the opposite end. The sections forming the pull rod 60 can be applied or removed to accommodate the

5

distance from the cage 34 to the respective end of the perforated tube.

Figure 5 illustrates an arrangement of perforated tubes in which the device of either Figure 3 or Figure 4 can be applied. Also, a fan and motor can be positioned in either funnel 66 for withdrawing air therefrom, and the closure member or damper 68 at the opposite end can be closed. All of the air is then withdrawn from the interior of the crib. Also, a cage, such as 34 in Figure 4 can be employed in the arrangement of Figure 5.

In any of the cases the apparatus for forced circulation of the air can be removed from the device of Figure 5, and with the closure members 68 open, natural air circulation takes place. The enlarged funnels 66 are effective for deflecting a greater amount of air through the perforated tubes than would be the case without the funnels.

The device of Figure 6 illustrates an arrangement whereby a greater number of points are provided for withdrawing air from the crib.

In Figures 1, 2 and 5, the vertical tubes 24 are provided so that air can be withdrawn from the grain in the upper part of the crib. These may be provided or omitted, as desired. If they are provided, the cage 34, such as in the insert in Figure 3, can be positioned under one of the inserts 24, and accordingly, a greater amount of air is withdrawn from the respective tube 24. The cage would be positioned at such a point for a greater length of time than between the vertical tubes, because there is more grain from which air is to be removed.

Some changes may be made in the construction and arrangement of the parts of my grain drier without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims such modified forms of structure or use of mechanical equivalents as may be reasonably included within their scope.

I claim as my invention:

1. A drier for use in a crib having material to be dried, and comprising a perforated tube adapted to extend in the crib and having at least one end adapted to communicate with the space outside said crib and an inner imperforate tube slidable in said perforated tube and having one end extended out of one end of said perforated tube, said inner tube being open at both ends, a partition wall extending transversely across said perforated tube and connected to the inner end of said imperforate tube in spaced relation to said inner end, and means at the outer end of said imperforate tube for withdrawing air from said imperforate tube.

2. A drier for use in a crib having material to be dried, comprising a perforated tube adapted to extend in the crib and having at least one end adapted to communicate with the space outside said crib, an inner imperforate tube slidable in said perforated tube and having one end extendable out of the outer end of said perforated tube, said imperforate tube being open at both ends, a partition wall extending transversely across said perforated tube and slidable therein, said partition wall being connected to the inner end of said imperforate tube in spaced relation to said inner end, an annular plate attached to the inner end portion of said imperforate tube, said partition wall and said plate being spaced apart longitudinally of said perforated tube and segregating a portion of the interior of said perforated tube in communication with said imper-

6

forate tube, and means for withdrawing air out of said imperforate tube.

3. A drier for use in a crib having material to be dried, comprising, a perforated tube adapted to extend in the crib and having at least one end communicating with the space outside of said crib, an inner imperforate tube slidable in said perforated tube and having one end extendable out of one end of said perforated tube, said inner tube having open ends, an annular plate surrounding said inner tube adjacent the inner end thereof, a solid plate spaced inwardly beyond the inner end of said inner tube, means securing said plates together, said plates slidably engaging the inner surface of said perforated tube and segregating a portion of said perforated tube in communication with said inner tube, and means for effecting air flow through said inner tube.

4. A drier for use in a crib having material to be dried, and comprising a perforated tube adapted to extend in the crib and having at least one end adapted to communicate with the space outside said crib, an inner imperforate tube slidable in said perforated tube and open at both ends, said inner tube having one end extending out of one end of said perforate tube, a partition wall extending transversely across said perforated tube and slidable therein, said partition wall being connected to the inner end of said imperforate tube in spaced relation to said inner end, funnel means at the outer end of said imperforate tube, and an impeller in said funnel means.

5. A device for use in a perforated tube constituting a portion of a ventilating system, said device comprising an imperforate tube adapted to slide in said perforated tube and open at both ends, an annular plate attached to one end portion of said imperforate tube and adapted to fit slidably within said perforated tube, an imperforate plate extending transversely across said perforated tube and adapted to fit slidably within said perforated tube and rigidly connected to said annular plate in spaced relation to the open end of the imperforate tube, and means for inducing air flow through said imperforate tube.

6. A drier for use in a crib, from which it is desired to withdraw air, said drier comprising a tube adapted to extend through said crib and perforated throughout substantially its entire length, the ends of said tube adapted to communicate with the space outside said crib, an inner imperforate tube having open ends, impeller means at one end of said imperforate tube adapted to be positioned outside the crib for drawing air out of said inner tube, the other end of said imperforate tube having a partition wall secured thereto and spaced therefrom, said partition wall extending transversely across said perforated tube, said inner tube and partition wall being slidable in either end of said perforated tube, said partition wall slidably engaging the inner surfaces of said perforated tube, and said inner tube being of such length that the partition wall may be slid into said perforated tube a distance at least one-half the length of said perforated tube.

7. A drier for use in a crib having material therein to be dried, said drier comprising a perforated tube adapted to extend in said crib and having at least one end adapted to communicate with the space outside of said crib, a pair of spaced partition walls extending transversely across said perforated tube, said partition walls being secured together and positioned in said perforated tube and slidably engaging the inner

7

surfaces of said perforated tube, an inner imperforate tube slidable in said perforated tube, said imperforate tube having open ends, one of which is adapted to be positioned outside the crib, means at said end of the imperforate tube for withdrawing air from said imperforate tube, and the other end of said imperforate tube being secured to one of said partition walls and communicating therethrough with the space between said pair of partition walls.

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