June 7, 1966 C. GARROW ET AL 3,254,467

METHOD AND APPARATUS FOR PRESSING FIBROUS MATERIALS HAVING ENTRAINED FLUIDS

Filed April 6, 1962 2 Sheets-Sheet 1

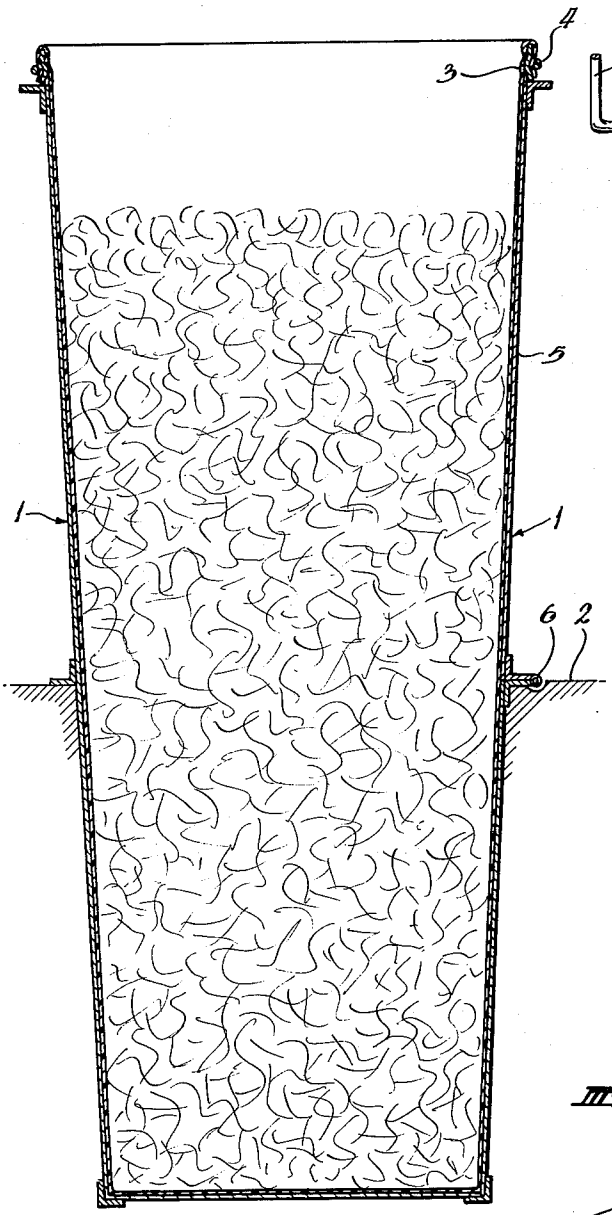


FIG. 1

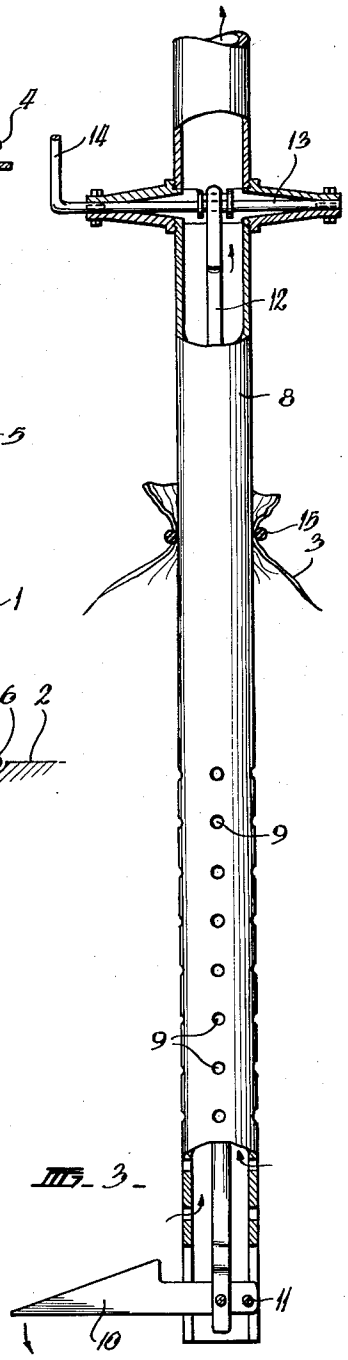


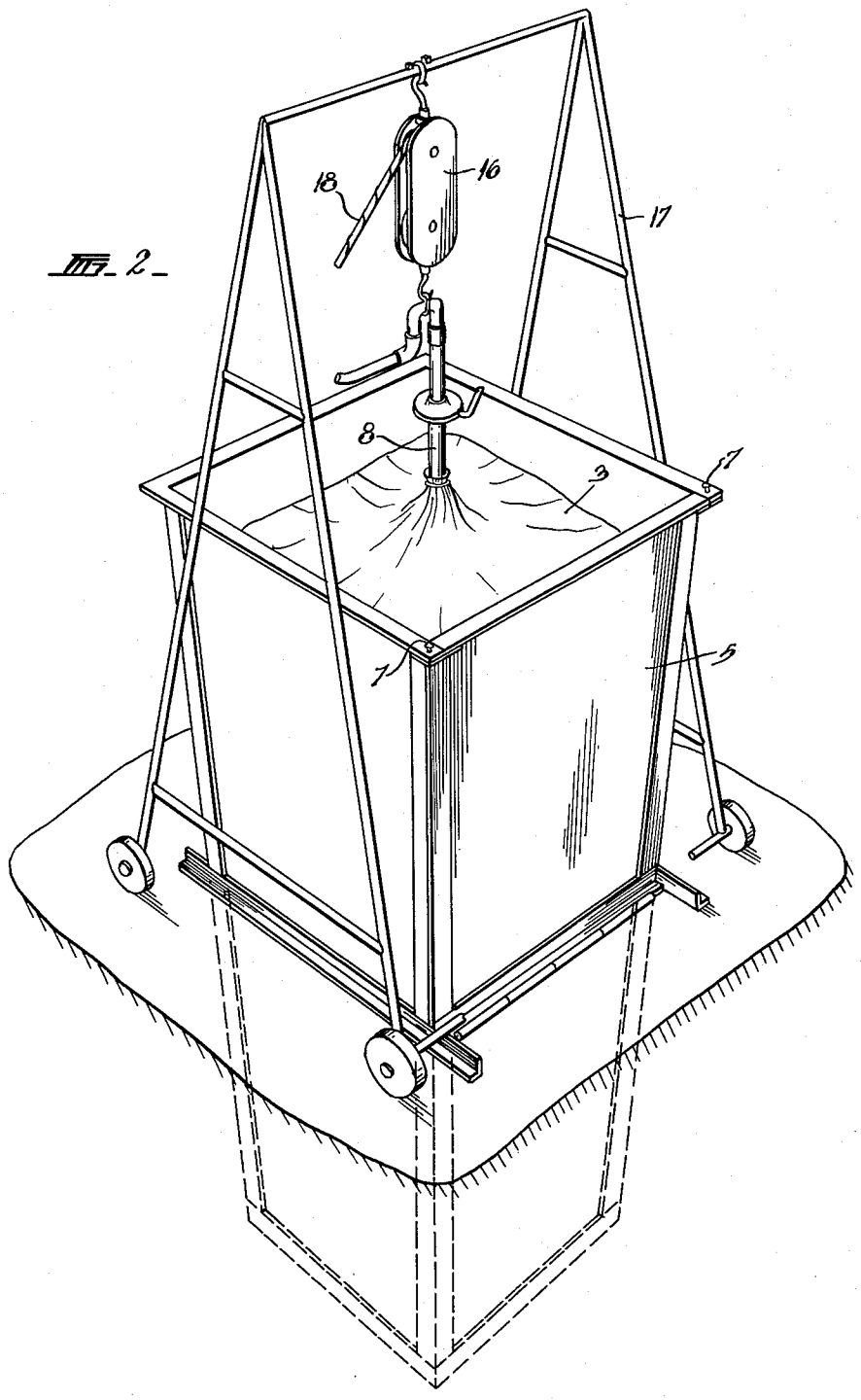
FIG. 3

June 7, 1966 C. GARROW ET AL 3,254,467

METHOD AND APPARATUS FOR PRESSING FIBROUS MATERIALS HAVING ENTRAINED FLUIDS

Filed April 6, 1962 2 Sheets-Sheet 2

FIG. 2



United States Patent Office

3,254,467
Patented June 7, 1966

3,254,467

METHOD AND APPARATUS FOR PRESSING FIBROUS MATERIALS HAVING ENTRAINED FLUIDS

Clyde Garrow, East Brighton, Victoria, and George Francis Flanagan, Pascoe Vale, Victoria, Australia, assignors to Commonwealth Scientific and Industrial Research Organization, East Melbourne, Victoria, Australia, a body corporate of Australia

Filed Apr. 6, 1962, Ser. No. 185,613
Claims priority, application Australia, Apr. 14, 1961, 3,580/61
2 Claims. (Cl. 53—24)

This invention relates to an improved process for pressing fibrous materials having entrained fluids, materials such as wool and other natural and synthetic fibrous materials are normally lofty and have a lot of air and, in some cases moisture, entrained with the fibres and are normally baled for transport and/or storage.

When handling such materials, for example raw wool in a shearing shed, one of the most arduous operations performed is normally that of pressing the wool into bales. Pressing involves initially stamping or tramping wool into a jute bale arranged in a press box followed by a mechanical pressing of the wool in the bale. It is, of course, desirable to produce uniform bales but in practice the size, weight and shape of the resultant bale depends greatly upon the efficiency of the wool press used and the care taken by the operator during loading wool into the press.

Considerable savings in transport and handling costs could be effected if such bales were of uniform size, weight and shape. It is well known that the density of bales varies considerably. A survey conducted some years ago showed that a bale pressed in the standard wool press has on an average a density of about 12 lbs. per cubic foot. A "dumped" bale, that is after further hydraulic pressing for export was found to have an average density of 15.9 lbs. per cubic foot. However, it was also found that individual bale densities varied considerably about the average.

Other requirements for the packing and transport of wool are the prevention of contamination of wool by jute fibres from the pack and maintenance of a fairly constant water content during transport and storage. In the case of wool, the need for maintaining constant water content arises from the practice of selling wool by weight.

Somewhat similar considerations apply to the packing and transport of other materials such as other natural fibres and artificial fibres.

Accordingly, it is an object of the present invention to provide an improved method for packing materials such as wool or other fibrous material for baling.

It is also a further and subsidiary object of the invention to provide a method and means for maintaining substantially constant the moisture content of fibrous material which has been baled.

According to this invention there is provided a method of pressing fibrous materials having entrained fluids which comprises the steps of feeding the material to be pressed into a flexible container which is substantially fluid tight and which is capable of reduction in volume. evacuating fluid from the container and causing or permitting the container to reduce its volume under the influence of atmospheric pressure and thereby to compress the material, and inserting the package thereby formed into a restraining envelope of greater size than the compressed package.

The restraining envelope, which may be a jute sack, is of a desired size and shape and fluid is again admitted to the container so that the material may again partly expand and assume the shape and size of the restraining envelope. The envelope can, of course, be of any desired shape or material. Alternatively, or in addition, the final shape and restraint may be provided by means other than an envelope. For example, the container may be bound by steel bands or wires. The flexible container may initially be supported by a rigid housing structure adapted to impart a preferred shape to the material during compression.

The invention also includes apparatus for carrying out the above method. The apparatus comprises essentially a substantially fluid tight container which is capable of reduction in volume under the influence of atmospheric pressure and means to evacuate fluid from the container.

It will be appreciated that whilst the method and apparatus of this invention is intended primarily to effect compression of the material by the action of atmospheric pressure on an evacuated container, other additional pressures, such as mechanical pressures may, if desired, be applied to assist in the process.

In order that the invention may be more fully understood, reference will now be made to certain practical embodiments used for the pressing of raw wool which will be described with reference to the accompanying drawings. In the drawings:

FIGURE 1 is a cross-sectional view of a form of apparatus for carrying out the invention using a flexible container within a rigid housing,

FIGURE 2 is a perspective view of the apparatus of FIGURE 1 in the condition where the compression has been completed and the container of compressed wool is hoisted on a wheeled gantry ready for discharge from the the housing and insertion into a jute sack, and

FIGURE 3 is a detailed side elevation, partly in section, of a preferred form of suction pipe which is used for evacuating air from the flexible container and which is also adapted for use as the means whereby the container of compressed wool may be lifted.

The apparatus shown in FIGURES 1 to 3 comprises essentially a metal bin **1**, about half of which is let into the floor **2** of a wool store, shearing shed or the like in which the pressing is to be done. Placed within the bin and forming a lining to it is a flexible airtight container **3** which may conveniently be a bag made of polyethylene film. The top of the bag is lapped over the top of the bin and is held in position on the bin by means of some sort of binding such as a rubber ring **4**. One side **5** of the bin is hinged at floor level by a hinge **6** which enables that side of the bin to be folded down when necessary. In the closed position the side **5** is held in position by means of pins **7** (see FIGURE 2). FIGURE 3 shows an evacuating pipe **8** which is connected to some suitable known evacuating means such as an evacuating pump (not shown). The pipe **8** is of special construction. Over approximately its lower half it is perforated as shown

at 9 to provide holes through which air may be sucked. At the bottom of the pipe there is a retractable projection 10 pivoted at 11 to one side of the pipe. Connected to the projection is a connecting rod 12 which extends up through the pipe to a cranked shaft 13 mounted in the pipe at right angles to its longitudinal axis and having a handle 14 which projects outside the pipe. By manipulation of the handle 14 the projection 10 may be brought to the position shown in FIGURE 3 wherein it is as right angles to the axis of the pipe or to an inoperative position in which it is substantially parallel to the axis of the pipe.

In operation, with the container in the bin, the suction pipe 8 with the projection 10 in its operative position (shown in FIGURE 3) is lowered into the bin and then wool is loaded into the container until it is almost filled. The dimensions of the bin and container are such that the capacity of the container is approximately three times the volume to which the material will ultimately be compressed. When the container is filled to the desired height the rubber ring is released and the top of the bag is folded around the suction pipe by some convenient means such as another smaller band 15 (see FIGURE 3). The vacuum pump is then started and air is sucked out of the container through the perforations 9 and as the container is evacuated atmospheric pressure acting upon its walls compresses the material within the container until, after a considerable degree of compression is obtained, the evacuating is terminated or if necessary reduced to an equilibrium value with any leakage which may be taking place. During this operation the suction pipe is preferably supported over the bin by means of a block and tackle 16 supported by a wheeled gantry 17.

After the compression is completed the suction pipe is hauled up by hauling on the tackle rope 18 and because the wool is tightly packed around the pipe and because of the engagement between the projection 10 and the wool the package of compressed wool is hauled up on the pipe. Hauling is continued until the compressed package of wool is contained within the upper portion of the bin and the hinged side 5 of the bin is then folded down. The gantry is wheeled out and the compressed package of wool is taken clear of the bin. At this stage the compressed package may be subjected to the final restraining means which will be used during its storage and transport. These may be for example steel bands or a conventional jute sack. Where a jute sack is used the compressed package of wool (which has been compressed to a volume smaller than that of the sack) is inserted into the sack. The projection 10 on the suction pipe is then retracted to its inoperative position parallel to the axis of the pipe and the pipe may then be withdrawn from the package. The neck of the bag is maintained sealed by any convenient means which may be the ring 15. The flaps of the jute sack are then closed in conventional manner and may be secured by conventional securing means such as wire bale fasteners. At this stage air is readmitted to the inner polyethylene container by any suitable means, for example by puncturing the wall of the container and as the air is readmitted the package expands so as to fill the jute sack and to assume the shape of the sack.

It will be noted that the walls of the bin converge slightly in the downward direction. It has been found that in the pressing of wool using an ordinary straight-sided bin the resultant package produced after evacuation tended to be of greater area at the base than towards the top and this led to some difficulties in subsequent placement of the compressed package within the jute sack and in obtaining a package which would readily assume the shape of the sack. It is believed that this tendency may be related to the compression of the lower portions of the wool under the weight of the wool above it and accordingly the bin was shaped as shown in order to counteract this tendency.

It is considered that the above described pressing technique has several advantages over the conventional wool pressing operations at present in use. There is first of all the fact that a good deal of the hard work of initially tramping a load of wool into a sack mounted within a press box and the straining required to close the flaps of a sack which is subjected to the internal pressure of the compressed wool is eliminated. Further and more substantial advantages are derived from the fact that it is possible by the above described technique to produce a bale of wool of which the size, weight and density may be more accurately controlled. Furthermore, it provides a simple means whereby a jute bale of wool may be provided with an inner liner of inert material such as polyethylene film, polyvinylacetate film, regenerated cellulose film or other suitable material which will protect the wool from contamination by the jute of the sack. A further advantage arises out of the fact that the inner container is impervious to water and this substantially protects the wool from moisture contamination and from substantial fluctuation in the moisture content of the wool. A still further advantage arises out of the fact that the apparatus required is less complex and less expensive to construct than conventional pressing apparatus and as aforementioned is easier and less arduous to manipulate.

Furthermore, it is believed that this apparatus possesses the advantage that pressing is carried out under more favourable conditions than in conventional presses. In accordance with this invention the pressing is effected at sub-atmospheric pressures. In conventional presses the compression is at pressures which are super-atmospheric. It is believed that the evacuation of air entrained in the wool leads to more efficient pressing and leads to the attainment of a predetermined degree of pressing with the performance of a lesser amount of work.

The above embodiment of the invention has been described by way of illustration of how the fundamentally new concept of pressing according to this invention can be carried into effect. It must be realised, however, that this embodiment is merely exemplary and although the invention has been illustrated by reference to the production of bales of wool which are substantially conventional in size and in shape and in the materials used it must be fully understood that the application of the invention is not limited by these considerations. Indeed it is believed that the invention may give rise to the opportunity for fundamental departures from present concepts of pressing and packing for storage and transport.

We claim:

1. A method of pressing and baling fibrous materials having entrained fluids which comprises the steps of feeding the material to be pressed into a flexible container which is substantially fluid tight and which is capable of reduction in volume, evacuating fluid from the container and permitting the container to reduce its volume under the influence of atmospheric pressure and thereby to compress the material, enclosing the container and its enclosed material in a restraining envelope of greater size than the container with the compressed material therein, and then readmitting air to the container while the latter remains enclosed in said envelope so as to permit the material to expand against and assume the shape and size of said restraining envelope.

2. In apparatus for compressing fibrous materials containing entrained fluids within a flexible fluid-tight container, the combination of a rigid housing structure for supporting the flexible container during the charging of the fibrous material into the container, and means to evacuated fluid from the container, said housing structure having downwardly convergent side walls whereby, upon the evacuation of the fluids from the container, a substantially parallel-sided package is produced, said evacuating means including a perforated pipe adapted to be embedded in the material and which has at its lower end a retractable projection which acts as a hook to per-

mit the packed container to be lifted by means of the tube at the completion of the compression.

References Cited by the Examiner

UNITED STATES PATENTS

773,876	11/1904	Lorillard	100—40 X
1,406,380	2/1922	Heath et al.	53—22
2,057,121	10/1936	Trevellyan	53—24
2,225,810	12/1940	Waters	53—22 X
2,241,943	5/1941	Berch	53—22
2,368,624	2/1945	Walton	53—112

2,564,969	8/1951	Goldberg.	
2,640,342	6/1953	Rand	100—37

FOREIGN PATENTS

223,044	7/1959	Australia.	

TRAVIS S. McGEHEE, *Primary Examiner.*

ABRAHAM G. STONE, FRANK E. BAILEY, *Examiners.*

L. O. MAASSEL, *Assistant Examiner.*