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COMPRESSION OF MATERIALS

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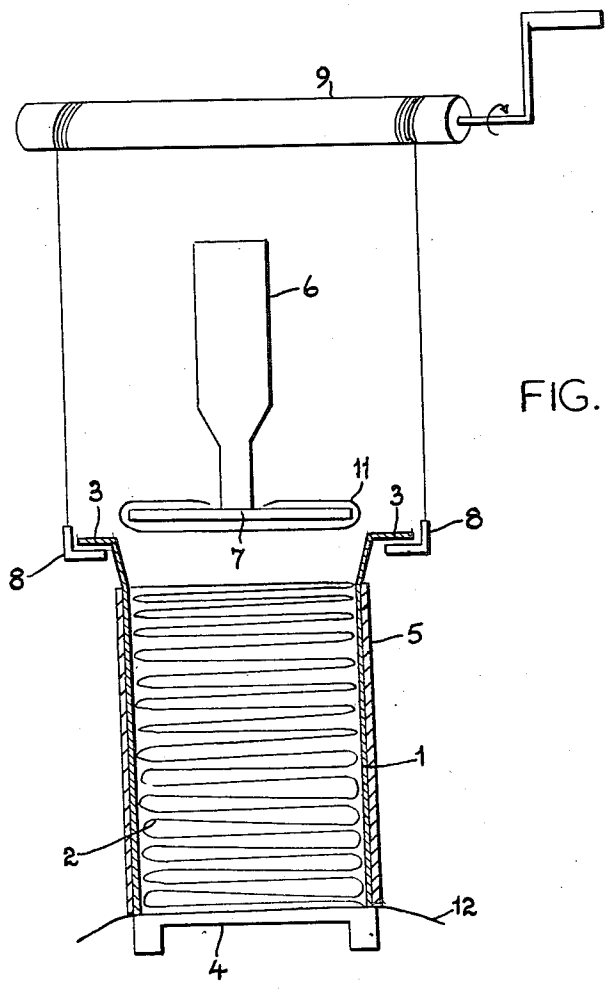
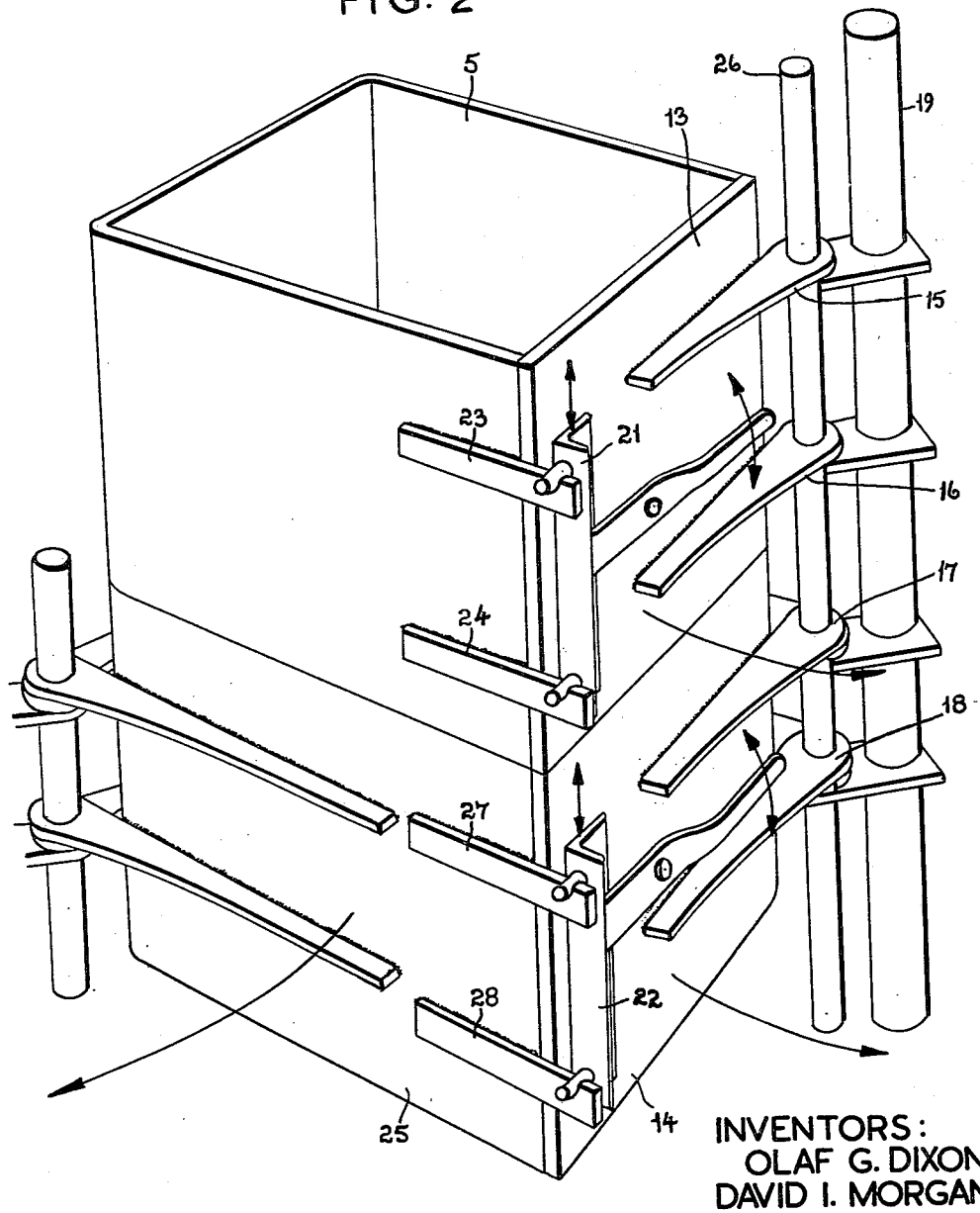


FIG. 1

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FIG. 2



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COMPRESSION OF MATERIALS

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This invention relates to the compression of materials and in particular of fibrous materials.

In many industrial processes large quantities of materials have to be stored or transported between processes or between different manufacturers. In order to save space in such storage or transport, if the material can be compressed without damage it is usual to pack it in compressed form in bales or other packages. An example is the case of synthetic fibres, which usually have to be transported from the fibre manufacturer to the textile or other manufacturer who is to produce articles from the fibres.

Cellulose acetate tow for the manufacture of cigarette filter tips has been packed for transport by feeding it in a regular manner into a bottomless plywood container on a stand. After filling, the container and stand are placed under a hydraulic press which compresses the tow in two stages. In the first stage the material is compressed to between ⅔ and ½ its original volume so as to hold it together, enabling the container, which has an opening side, to be removed. The tow is then further compressed as much as is practicable, and wrapping material such as hessian is fastened around it before the press is released. This two-stage compression has been used by reason of the combination of circumstances which arise in production. It is desirable to have one press for baling the tows produced by several machines, and for transporting the uncompressed tow from the machines to the press lightweight containers are desirable. However, the full compression causes the sides of the bale to bulge and this bulging would fracture the lightweight containers.

The bulging of the sides of the bale is also undesirable in the case of tows, since it prevents smooth unwinding of the tows when the bales are unpacked.

According to this invention a method of compressing material comprises the steps of supporting a bottomless first container on a stand which closes its bottom, placing the material to be compressed in the first container, enclosing the first container in a rigid second bottomless container having mechanical strength sufficient to withstand lateral forces due to subsequent compression of the material, removing the first container but not the material out of the second container, and compressing the material in the second container against the stand on which the first container stood to form a bale.

Further, according to the invention, apparatus for compressing material comprises a first container and a second container, each open at its top and bottom, the first container being capable of fitting within the second, and a stand for closing the bottom of and supporting the first container whereby material may be loaded into the first container when it is in position on the stand, the loaded container on the stand may be enclosed within the second container and may then be removed, leaving the material supported by the stand within the second container for compression, the second container having mechanical strength sufficient to withstand lateral forces produced by such compression and having at least one openable side part to facilitate insertion of the first container and removal of the material after compression.

Preferably the first container is lifted out of the second container and is a close sliding fit therein. A slight degree of compression may be imparted to the material before the first container is removed so as to hold it in position.

The second container may have one or more side walls or side wall parts which are hinged and can be opened to remove the compressed material. Preferably, wrapping material is placed over the stand before the first container is placed on it and further wrapping material is placed above the material before it is compressed. The second container may thus be opened while the material is still held in compression and the wrapping material can be stitched or otherwise fastened around it.

The first container is preferably formed from lightweight material such as resin-bonded glass fibre.

An example of apparatus for carrying out the method of this invention is illustrated by the accompanying drawings in which:

FIGURE 1 is a diagrammatic sectional elevation of apparatus for compressing and baling tow.

FIGURE 2 is a perspective view of a part of the apparatus.

A bottomless box-like container 1 is formed from resin-bonded glass fibre and has outward flanges 3 at its upper end. The container is placed on a stand 4, over which a sheet of bale wrapping material 12 such as hessian has been placed, near to a tow-producing machine and tow 2 is fed into it in a regular manner. When the container 1 is filled, it is moved, with the stand 4, into a second container 5 which is secured below a hydraulic press 6, the head 7 of which has a further piece of wrapping material 11 around it. The second container 5, as shown in FIGURE 2 has one side divided into two portions 13, 14 mounted on hinges 15, 16 and 17, 18 respectively so as to open to admit the first container 1, which is a close sliding fit in the second container 5. The hinges 15, 16, 17 and 18 all have the same hinge pin 26. The second container 5 is securely supported clear of the floor by a support 19 so that the stand 4 will slide just below it, as shown in FIGURE 1.

When the first container 1 is in position within the second container 5 the side portions 13, 14 of the latter are closed and secured by sliding catches 21, 22 respectively, which engage fixed bars 23, 24 and 27, 28 respectively, secured to the adjacent side of the container 5. The head 7 of the hydraulic press is then lowered to engage the top of the tow so as to hold it in position, and may impart to it a slight degree of compression, and hooks 8 of a lifting device 9 are engaged below the flanges of the first container 1, and the lifting device is operated to lift the first container 1 out of the second container 5, over the head 7 and press 6, leaving the tow undisturbed in the container 5, due to the slight immobilising pressure of the head 7. The press 6 is then operated to compress the tow to the desired bale size, usually at least to half its original volume. During this compression the tow is prevented from bulging at its sides by the walls of the container 5, which is of massive construction so as to withstand the lateral forces produced by the tow during compression.

When the tow is compressed it is wholly contained within the lower parts of the walls of the container 5, which are hinged and can be opened, as shown in FIGURE 2 in the case of the lower wall parts 25 and 14, to allow access to the tow when it is held under compression by the press 6. These lower parts, and the corresponding lower parts of the other walls, which are normally held closed by the catch parts 22, 27, 28 and corresponding parts on the opposite corner of the container, are opened, and the wrapping material 11, 12 is wrapped and fastened around the compressed tow, for

example by stitching or other fastenings to form a bale. The press **6** can then be released, and the tow will be held in its compressed state by the wrapping material and/or fastenings and can be removed bodily from the stand **4** for storage or transport. The first container **1** can then be lowered back into the second container **5**, and with the stand **4** can be removed after opening the wall part **13** and releasing the hooks **8** from its flanges. The container **5** and stand **4** can then be returned to the tow-producing machine for refilling.

Several first containers such as **1** would normally be used in conjunction with one assembly of press **6**, lifting device **9** and second container **5** for baling the output of one or more tow-producing machines.

Since tow baled by this method is prevented from bulging at the sides, it can be drawn freely from the bale, after removing the wrapping material, for further processing.

Although the terms "top" and "bottom" and the like have been used in this specification in describing the invention in the manner in which it is normally, and most conveniently, carried out with the containers standing upright on the stand, it will be appreciated that this position is not essential, and the claims following are not limited thereto.

What we claim is:

1. A method of compressing material comprising the steps of placing the material to be compressed on a stand and within a bottomless first container also supported on the same stand, enclosing the first container in a rigid second bottomless container having mechanical strength sufficient to withstand lateral forces due to subsequent compression of the material, removing the first container but not the material from the second container, and compressing the material in the second container against the stand to form a bale.

2. A method according to claim 1 wherein the first container is a close sliding fit within the second container, and is lifted out of the second container.

3. A method according to claim 1 including the step of applying a slight degree of compression to the material before and during removal of the first container so as to hold the material in position.

4. A method according to claim 1 including the steps of placing wrapping material above and below the material before it is compressed, and of removing the second container from the material and fastening the wrapping material around it whilst it is held under compression.

5. A method according to claim 4 in which the material in the second container is removed by separating side parts of the second container.

6. Apparatus for compressing material comprising a first container and a second container, each open at its top and bottom, the first container being capable of fitting within the second, and the second container being of a substance which will withstand latitudinal forces produced by the compression of material in it, and hinged opening means on at least one side of said second container to facilitate insertion of the first container and removal of the material after compression, and a stand for closing the bottom of and supporting the first container whereby material may be loaded into the first container when it is in position on the stand and the loaded container on the stand may be enclosed within the second container, and means for compressing material against the stand, in combination with means for removing the first container leaving the material under compression and supported by the stand within the second container.

7. Apparatus according to claim 6 including means for opening a lower part of each side of the second container to allow access to all sides of the material when compressed.

8. Apparatus according to claim 6 including means for opening the whole of at least one side of the second container to allow lateral entry of the first container.

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