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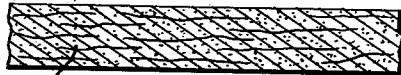
A. C. FISCHER

2,243,857

FIBER ARTICLES, SUCH AS MATS AND THE LIKE

Filed Feb. 26

Fig. 1.



COMPACTED UNDIGESTED
FIBROUS MATERIAL MIXED WITH
VARIOUS CLAYEY SUBSTANCES

Fig. 2.



COMPACTED UNDIGESTED FIBROUS
MATERIAL CONTAINING LIME, EARTHY
MATERIAL, FERTILIZER, PLANT FOOD,
OR SEED AND EARTHY MATERIAL

Fig. 3.



COMPACTED UNDIGESTED
FIBROUS MATERIAL AND
EARTHY MATERIAL

Fig. 4.



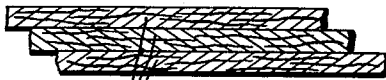
COMPACTED UNDIGESTED
FIBROUS MATERIAL

Fig. 5.



COMPACTED UNDIGESTED
FIBROUS MATERIAL
AND LIME OR CLAY

Fig. 6.



COMPACTED UNDIGESTED
FIBROUS MATERIAL

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FIBER ARTICLES, SUCH AS MATS AND
THE LIKE

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20 Claims. (Cl. 47-9)

This invention relates to the utilization of waste farm products and involves the utilization of such fiber products as straw, corn stalks, cane fiber, shredded fibers of various kinds, waste fibrous materials, or fibrous materials which may occur in abundance and which will be available for various manufacturing purposes.

The object of my invention is to manufacture and prepare this waste straw, fiber, etc. into a compacted sheet without digestion as distinguished from such process as precedes the manufacture of wall boards and the like. The object of my invention is to take the raw material, place it in a compacting machine, either alone or together with other materials, and form various articles of manufacture. The purpose is to utilize a compacting machine somewhat on the order of a mechanical hay baler. The present process, however, involves a machine which will manufacture sheets one quarter of an inch to one inch or more in thickness, by no means approximating the dimensions of a bale of hay or a bale of shavings. The sheets are preferably made up to 48 inches in width and to the thickness enumerated. The sheets are formed by placing into a receptacle the necessary fiber and continuously impacting it between spaced walls and thru the impacting device interlacing or intertwining the fibers so as to make a cohesive, interlaced mat. An apparatus for producing a sheet mat of the type described above is fully disclosed in my co-pending application Serial No. 80,465, filed May 18, 1936, entitled "Compacting apparatus and method."

One of the features of the process would be to provide equipment with a device for threading these mats so that when they are released from the pressure they will be controlled more or less to the size to which they have been compacted. Where adhesion is depended upon by the fibers to make the sheet cohesive and remain to a uniform size, it will not be necessary to stitch or intertwine the threads of the fibers to hold the sheet in its compacted form.

The sheets and material fabricated from the products above described are new and novel and may be produced by a compacting action in a compacting machine which is operated by a stroke thrust, by compacting, by extrusion and by compacting by a stroke thrust in which the compacted material is traveled upon a foundation sheet. The simplest form of my invention relates to a fibrous mat compacted in a manner so that the thrust arm of the compacting device pushes and interlaces the fibers in the mat being created,

and by forcing fibrous material thru a confined area which causes it to compact and depend upon the thrust for forward travel.

My invention relates to treating this compacted mass either with an adhesive binding material which may be added, or with its own adhesive material self-contained, or thru a stitching means to keep the material compacted to its form while in the machine after its release from the machine.

One of the features of my invention is to utilize waste material on the farms and facilitate the spreading of fibrous material for mulching or other purposes.

Another feature of my invention consists in a compacted mat of fibrous material held together in a compacted form and utilized between a road surfacing and the sub-soil, as a protective covering over hot beds, as litter for animals or poultry, as an insulation means for crude wall and housing purposes, and also for an overlay over concrete roads as a moisture preserving means in the concrete, and the possibilities of later use for mulching purposes. This mat may also be used as an underlay on roof decks under waterproofing paper or roofing materials, and consists in its simplest form of mats from one-quarter to two inches in thickness and ranging from 12 to 48 inches in width and in lengths from three to ten feet or longer. Where utilized for this purpose these mats are fabricated from undigested fibrous material, although there is nothing to prevent the same mats being fabricated from digested material, but in the case of a digested material it would add greatly to the expense of manufacture.

Different embodiments of the invention are illustrated in the accompanying drawing, wherein Figs. 1 and 2 are cross-sectional views of different sheets in accordance with the invention, and Figs. 3-6 are cross-sectional views of laminated sheets in accordance with the invention.

Another feature of my invention relates to compacted sheets of fibrous material having mixed therewith various clayey substances, as shown in Fig. 1. These sheets may be fabricated either on a compacting machine, an extrusion machine or if preferred may be rolled where consistent. These sheets are prepared by mixing fibrous material with the clay, and where it is prepared from dry materials the sheet would be prepared by compacting the straw and powdered clay in a compacting machine as previously described. In transportation some of the clay would be lost which was not held in position by

the fibrous material, but where the clay was used mixed with the fibrous material it could be prepared either in the compacting machine or in an extrusion press or under rolls. My fibrated clay sheets are for the purpose of providing a clay layer where it is desirable to preserve moisture in upper strata in soils where there is very little clay evident. These may be in the wet or dry state, or in powdered clay form, and these clay sheets mixed with straw may further be used as covering material by baking the clay in the straw and imparting thereto rigidity and permanency. These clay sheets, therefore, serve in a powdered fibrous form, in a wet clay fibrous form, in a dry compacted clay fibrous form, in a baked clay fibrous form, or in an oiled clay form, covering a very great diversified use for this type of material.

Another feature of my invention is to utilize muck in much the same manner with fibrous material, which more readily lends itself to mixture with this fibrous matter in the dry form. When mixed in the wet form with fibrous material and later dried or baked I would be providing an acid condition in the soil and likewise would be providing a moisture retarding means in the soil, at the same time forming a mulching or peat bearing layer, which may be readily utilized in soils where plants desiring this foundation may be accommodated.

Another feature of my invention is to form a lime bearing, fibrous, compacted sheet, as shown in Fig. 2, for soils which are negligible in lime, and particularly in sandy soils where it is difficult to hold the lime in suspension in a satisfactory manner. In forming these sheets either in the dry, powdered, fibrous form, the wet, hydrated lime, fibrous form, or the gypsum form in a dry condition suitable for rewetting, I prepare a stratum favoring certain conditions highly desirable in the soil and save much labor by preparing a sheet in proper form by simply spading the soil which is negligible in these qualities over it.

Another feature of my invention is to provide these compacted fibrous sheets containing fertilizer, plant food, nitrogen or hydrogen elements, in much the same manner as described above, and utilize them for agricultural purposes, as shown in Fig. 2.

Another feature of my invention is to provide these same fibrous sheets as linings for poultry houses, and in such case insecticides are incorporated with the fibrous material and compacted into these fibrous sheets. I also prepare these sheets in various thicknesses as mulch covering sheets, both for utilization above the ground and below the ground. In such instances I may incorporate therein various ingredients which would be helpful to plant growth, particularly where sheets such as these were utilized around broad-leaved evergreens, which require treatment from time to time of such products as aluminum sulphate, tannic acid and other acid forming products helpful to the soil surrounding this type of plants.

One of the objects of my invention is to utilize straws as fibrous matter in their undigested state by intermixing preferably thru a compacting action, intertwining and mixing with earthy materials, fertilizers, binders, etc. and compacting same into various sheets in given thicknesses, likewise in compacting the fibrous material in regular alignment and mounting said compacted

material upon a base sheet and suitably fastening said fiber thereto, as shown in Fig. 5.

I may likewise take a base sheet of a very thin tissue paper or other types of paper, impregnating same with an adhesive glue, waterproofed or otherwise, or other colloid substances, which may cause fibrous matter which comes in contact therewith to adhere to one or both sides thereof. Or I may mix a fibrous material with some of this colloid matter and by suitable compression form a very thin sheet of the coarse, fibrous material by pressure rolls, which would press together a sheet as thin as $\frac{1}{8}$ of an inch. I likewise may take digested fibrous material and press the same to the thinnest possible dimension, making a continuous sheet and drying the same for the purpose of creating an emulsion sheet or a suitable base sheet for clay deposit or other earthy materials or fertilizers, for the purpose of placing the same in the soil.

In preparing these materials for manufacture I prefer to use them in their natural dry state, but where compacted they may be utilized in a wet state and may previously have gone thru a digesting process, such as is customary with insulating fibers and paper fibers. In either case the material would be compacted but in one case it would be dried by a heating process after being compacted. On the thicker sheets the preferred form is a compacting process rather than a rolling process. On extremely thin sheets where mulching materials and depository linings or fertilizers and soils are to be considered I may squeeze this material between heavy rolls in order to reduce it to the thinnest possible dimension. Where the fibrous material is undigested I may use any suitable colloid binder or I may use varnishes, resin, formaldehyde products, waterproofed glues, ordinary glues, in either widely diffused or concentrated form, as may be required, or I may use a stitching or binding means where it is desirable. I likewise may use such binders as clay, peat and other soil binders, where desirable to incorporate certain soil with the fibrous material.

Where rolls are utilized there, of course, would be no compacting machine employed. This material before compacting may be mixed in suitable mixers. Where the fiber and soil elements are to be in intimate contact the material may be suitably compacted thru an extrusion machine, or where it is desired to have a consistency which permits such operation, or the soil elements may be placed upon the already compacted sheet in the shape of an emulsion or a plastic mass spread over the surface of one or both sides, the purpose being to provide a matted material which could be readily placed under difficult soil conditions and preserve moisture and at the same time furnish a fertilizer in the soil, or where the material is to be used in thin sheets for mulching purposes the soil's conditioner may be placed over fibrous material as a thin veneer or wash. This would be for application to the surface of the soil rather than being imbedded in the soil.

I, therefore, provide for compacting sheets in a thicker form, in very thin layers, in a gathered form, in which the fibers are laid in regular form, for instance, as for thatching. I also provide a sheet in which the surfacing is placed on a base sheet flatwise, and a sheet in which the fibrous material is compressed under heavy rolls and used as a mulching sheet. Another form is a sheet in which the fibrous material is

adhesively fastened and compressed to a very thin sheet or adhesively fastened to a base. Another form is that in which the fibrous material is mixed with clay, peat, or other soil mixture for the purpose of furnishing a water preserving means, a fertilizing means and a soil treatment means.

It is readily understood that I may use waterproofing means to effect waterproofing conditions in the various sheets and likewise I may use fireproofing materials to effect fireproofing qualities in the fibrous material.

It can be readily understood that I may take the fibrous material and mix it with a binder and compact it. I may take fibrous material and mix it with earthy materials in a dry state and compact it. I may also take fibrous material and mix it with earthy materials in a wet state and compact it, later drying out the moisture, or I may take fibrous material without any additions except a binder, such as, silicate of soda, vegetable glue and various colloids which might do for binding purposes. Where wet clays, peat or other soils are used in conjunction with the fibrous material I may extrude these sheets rather than compact them thru an extrusion press or suitable brick making machine, in which the die would be adapted for extruding wide or narrow sheets, the purpose being to facilitate the use of various soils in places where sandy soils are predominant and furnish clay from nearby clay beds for the benefit of those requiring clay strata to preserve moisture in the soil.

I may also take these same compacted sheets, immerse the same in an emulsion or a liquid of various types, and further compact the same in a press to effect a denser mat, or I may previously mix binding material in with the coarse, fibrous material in an undigested state, compact the same and later further press the same in a hydraulic press to obtain still more compacted sheets.

In fabricating this product I do not wish to be limited to undigested fibrous material but I may use digested material and use the natural adhesive which is formed from the digestion process as a binding material for the fibrous material, but insofar as compacting and sheet forming is concerned it would be prepared in the same manner.

Another feature of my invention is to prepare a preformed sod in sheet form, which comprises a mixture of fibrous material and earthy material, the earthy material to be of a consistency which will quite readily adhere, and also to contain necessary plant foods and fertilizer for the proper development of a good sod. It may be desirable to line the bottom of this sheet with a layer of clay in order to keep the moisture in the earthy material comprising the upper layer, as shown in Fig. 3. In this sense it would also be a laminated sheet in that it would contain a moisture preserving means as well as the earthy means for the growth of the seed planted therein. The laminated sheets may assume the form of a core of undigested fibrous material coated with clay and held between sheets bonded to the side or sides thereof by an adhesive binder as shown in Fig. 4. Furthermore, the laminated fibrous sheet may have center laminations comprising a mixture of undigested fibrous material and lime with fibrous material on opposite faces of the center laminations, as shown in Fig. 5. If desired, the center laminations may consist of clay without necessarily being bound together by

the undigested fibrous material. In Fig. 6 is shown a plurality of layers of compacted undigested fibrous material, each of which may be modified by the addition of materials for specific purposes, such as clay, lime, earthy materials, fertilizer, plant food, seeds, or insecticides.

This sheet may be prepared merely in the fibrated, earthy form, or it may be prepared in the fibrated, earthy form with a clay liner, or in the fibrated earthy form having seed contained therein, the purpose being to ship this prepared sod to the place where it is to be utilized as a cover for grass and sod purposes.

In the manufacture of the sheets herein described, the matted sheets of fibrous material would be constructed primarily of such material as wheat or oat straw, flax, hemp, rye, in fact any fibrous material which may prove satisfactory and which may be available.

The fibrous matter in its compacted state would be stitched with suitable twine or if it was preferred to use an adhesive binder, such binding material as silicate of soda, waterproof glues, synthetic resins, and like materials may be employed by mixing the adhesive material with the fiber material either at the time of mixing or by allowing same to percolate through the sheet in a liquid form. In either case the sheet would be flexible and suitable for handling.

Where the sheet is prepared with earthy material, fiber to the extent of fifteen or twenty per cent may be mixed with the earthy material and compacted into sheet form. Where it is desirous to use a fibrous material with a very slight admixture of earthy material, the compacting and stitching would be done in much the same manner as the previously described sheet.

Where clay is mixed with the fibrous material, thirty per cent or more may be employed in admixture with the wet plastic clay and either extruded or compacted into sheet form. The sheets may also be fabricated by mixing the fibrous material with lime and then compacting same into sheet form by stitching or otherwise.

Likewise, the fibrous material may be placed in an insecticide liquid solution, suitably dried, and compacted and fabricated into sheet form as previously described, or the dry straw sheet may be immersed in the insecticide or fertilizer solution for the purpose of coating this material with these solutions and later drying them.

Such insecticides as solutions prepared from tobacco stems, dusting materials, arsenate of lead powder, copper solution, Black Leaf, Bordeaux lime, sulphur and numerous others may be employed. Where fertilizer solutions are used, such materials as the usual nitrates, potash substances, plant foods, blood and bone, bone meal, sheep manure, aluminum or ammonium potash, sulphate nitrate and numerous others.

The exact proportions for the manufacture of these sheets will depend a great deal upon the distance they must be shipped and how they must be transported. Also various mats for different localities will be furnished from various earthy substances peculiar to the locality, and, therefore, ingredients will have to be examined and such properties added as will bring them up to the highest efficiency. This can readily be ascertained by the proper tests and such fertilizer and plant foods added as to bring the fibrated sheet up to its proper strength and effectiveness.

Another feature of my invention is to fabricate fibrous mulching mats, either for the purpose of placing over the surface of the soil or placing

within the soil for the purpose of retaining moisture and eventually as a leaf mould or fertilizing material in the soil.

I do not wish to be limited in the type of fiber or in the finished surface material which may be produced in this manner. Any of the vegetable, grain or plant fibers may be utilized in whole or in part, shredded or in full, preferably in an undigested state.

I do not wish my invention to be limited to undigested fibrous material when digested fibrous material may give as good results, although the raw fibrous material will make a coarser and more economical product than digested vegetable matter, which would be broken down more or less thru the digesting process.

Various modifications of fibrous matted material rather than limitations to specific kinds are intended and I, therefore, do not wish to be limited to any particular type of fibrous material. My invention primarily consists of the compacting, binding together and preservation in sheet form of fibrous products, further in surfacing these products and incorporating therewith earthy materials and preparing thatchlike surfaces welded with long straw fiber, palmetto strands, or other suitable tough fibrous material suitable for this purpose.

The machine with which this fibrous material is to be compacted is fully described in a separate application for Letters Patent, Serial No. 69,814, filed March 20, 1936, now Patent 2,200,269.

Having thus described my invention what I claim is:

1. A compacted fibrous mat comprising undigested fibrous material in substantial alignment held together by an adhesive mass dispersed throughout said fibrous material.
2. A compacted sheet comprising clay and undigested compacted fibrous material in substantially aligned elongate form acting as a carrier for said clay.
3. An extruded sheet comprising a substantial proportion of clay mixed with undigested fibrous material in substantially aligned elongate form acting as a carrier for said clay.
4. A preformed sheet comprising undigested fibrous material in substantially aligned elongate form and coated with clay held between sheets bonded to the side or sides thereof by an adhesive binder.
5. A preformed sheet comprising compacted undigested fibrous material in substantially elongate

alignment and earthy material dispersed throughout said undigested fibrous materials.

6. A compacted sheet comprising undigested fibrous material in a compacted state in substantially elongate alignment and agricultural lime dispersed throughout said fibrous material.

7. A soil sweetener comprising undigested fibrous material in substantially elongate alignment and lime dispersed throughout said fibrous material and preformed in sheet form.

8. A compacted fibrous sheet saturated with a lime solution and dried.

9. A preformed fibrous sheet saturated with a lime solution and dried.

10. A preformed sheet comprising undigested fibrous material in a compacted state, lime and earthy material.

11. A preformed sheet comprising undigested fibrous material in a compacted state in substantially elongate alignment and agricultural lime in a plastic state dispersed throughout said fibrous material.

12. A preformed laminated sheet comprising undigested fibrous material, one of the laminations containing agricultural lime.

13. A preformed laminated fibrous sheet, the center laminations comprising a mixture of undigested fibrous material in a compacted and aligned state and lime.

14. A preformed sheet comprising a plurality of outer and inner laminations, the outer layers comprising fibrous material and the inner layers consisting of clay.

15. A preformed sod forming sheet comprising compacted undigested fibrous material, earthy material and seed material.

16. A sheet comprising undigested fibrous material, a clay base and an earthy top suitable for planting seed therein.

17. A preformed sheet comprising undigested compacted fibrous material in substantially elongate alignment and clay dispersed therethrough.

18. A flexible mat comprising undigested fibrous material mixed with clay, impacted and extruded.

19. A mat comprising undigested fibrous material mixed with clay, impacted and extruded.

20. A mat formed mainly of undigested fibrous material in layers having their edges exposed on the sides of the sheet impacted together in a direction in the plane of the sheet and secured approximately in this impacted position.

ALBERT C. FISCHER.

CERTIFICATE OF CORRECTION.

Patent No. 2,243,857.

June 3, 1941.

ALBERT C. FISCHER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, line 6, claim 6, for the word "line" read --lime--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of June, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.