This invention pertains to a new and improved type of a cementitious slab, and the process for making the same. Though it is particularly directed and adapted to the production of a cementitious slab encased in paper liners, it can be applied with equal effectiveness in the process of making somewhat similar types of products.

In the manufacture of a cementitious wallboard type of construction material particularly such as gypsum wallboard, the cementitious mix is first prepared in separate equipment. This mix consists of a major portion or approximately 100 parts of calcium sulfate hemihydrate suspended in about 70 parts of water. A weight reducing agent, such as a premixed and preformed foam as described in the C. K. Roos Patent No. 2,017,622 is added to the mixture of calcium sulfate hemihydrate and water in the desired amount to provide sufficient bulk and reduce the apparent density of the mass. In addition to acting as a weight reducing material the structure of the foam imparts a cellular formation and other desirable characteristics in the cementitious mass when the latter has set or hardened to provide an additional advantage of heat and sound insulation.

The foam, calcium sulfate hemihydrate, water and other additives such as fiber, are thoroughly blended together in a special device until a uniform mixture known as a "slurry" is obtained. The slurry is poured and encased between paper sheets or liners, and rolled while still plastic to the desired thickness. The shaped but unset slurry moves in a continuous ribbon on a conveyor until the final set and hardening has occurred. It is then cut to desired lengths and passed through a dryer to remove excess moisture and dry the paper liners. When dry, the cut board is bundled, and stacked in the warehouse for further disposition. As mentioned above the preparation of the foam, and production of a cast cementitious slab containing the premade foam is described more fully in the Roos Patent No. 2,017,622.

In course of making gypsum wallboard, the top liner generally referred to as the face liner, is placed on a conveyor belt, with its face downward. This sheet is slightly larger than the actual width of the wallboard to provide a folded edge thickness portion and a small amount of undulation. A scoring and a creasing device provides grooves for suitable bends which when folded properly form the edge walls of the wallboard and the overlapped margin that is embedded in the slurry deposited upon the sheet from the mixer. A cover sheet which serves as a back sheet of the wallboard is placed on the slurry. The marginal edges of the cover sheet and the sheet carrying the slurry are adhesively secured to provide an envelope. Thus it can be noted that the edge portion of the wallboard, i.e. the marginal section has three reinforcing sheets of heavy paper. This is the part that not only receives most of the abuse, while the wallboard is being handled, but also when installed must receive the nails that fasten it to the wall or ceiling supports.

In producing wallboard it is desirable to have recessed or tapered ends and edges. Thus when the recessed margins but each other over a common support, like a shelf, a slight hollow of about 15 to 30 thousandths of an inch in depth is formed about the joint. Into and about the adjacent surfaces of this joint is placed a plastic cementitious adhesive. A perforated paper tape preferably having tapered edges such as described in the Page Patent No. 2,047,982 or some other means of joint reinforcement is embedded in the plastic adhesive. By means of a broad putty knife pressure is applied to the partially embedded tape, and the plastic adhesive cozes through the perforations to the top surface. Here the adhesive is spread uniformly and then treated in a customary manner to obtain a smooth, monolithic appearing wallboard wall.

In producing a recessed end wallboard, it is necessary to form a recess transversely across the wallboard at uniformly selected lengths. However, since the board "grows" or expands linearly, it becomes immediately apparent that some means must be provided that not only will form the recess but also at the proper moment. The Page Patent No. 2,168,903 discloses one means of doing it, which with a slight modification and insertion of a proper relay system will in a large measure overcome this difficulty.

In the Page device a recessed end molding slit is inserted beneath the bottom liner. A recess is thus formed. The soft slurry encased in the fibrous sheets will also form a "hump" on the cover sheet and the assembly moves forward until set. When set it will be found that over the slit portion of the board is formed a slight but noticeable "hump." This "hump" which is on the back side of the wallboard interferes with the formation of a smooth surfaced monolithic wall when a joint treatment such as described above is used.

It therefore is but one of many other objects of this invention to provide a process that will
successfully eliminate the protuberance on the back surface over the recessed end. A further object is to provide a means that will accomplish the above set forth objective.

These and other objects, adaptations, extensions and modifications will become apparent to those skilled in the art without departing from the fundamental principles underlying this invention as described herein and particularly in view of the drawings forming a part hereof.

In Figure 1 is shown a diagrammatic section of a referred embodiment of the apparatus with which the process to produce the improved product can be performed.

Figure 2 shows a section through a joint over a common support of the wallboard produced by the conventional method.

Figure 3 shows a somewhat similar section as that shown in Figure 2, except that the new and improved type of wallboard is used in the joint construction.

The bottom or face liner 10 forming a part of the wallboard is fed from a source of supply (not shown) under a spout 15 and discharging a cementitious slurry 16. The latter preferably is the composition described in the Roos Patent No. 2,017,022. The slurry 16 deposited on the liner 10 preferably passes over a vibrating plate 11 actuated by a vibrating device 13. This step in the process of making wallboard is highly desirable for it removes large masses of occluded air that may at some subsequent stage cause blisters and impart other undesirable qualities in the finished product. This process is more fully described in the Camp et al. Patent No. 2,200,155. The processed slurry is discharged at a sufficient rate to maintain a head of it before the master rolls 22 on the partially folded liner 16. Another liner 20 (the back side of the wallboard) is then placed over the slurry 16 as it passes between the nip of the master rolls 22 and simultaneously forms the assembly into a long laminated ribbon 25 of fibrous envelope encasing a cementitious slurry. The rolls 22 are adjustable vertically so that the thickness of the extruded ribbon may be varied as desired.

At some selected point preferably past the master rolls 22 and before the belt conveyor 26 a series of slats 14 are inserted crosswise under the ribbon 25, at preselected distances apart. These may be inserted by hand but obviously a mechanical device is preferable, and that shown in the above mentioned patent to Page serves admirably. These slats have a very small height, not much over 0.050 of an inch, and generally have a tapered or bevelled longitudinal edge so that when impressed into the face of plastic ribbon, a recess having like or similar contours in intaglio will form and be retained by the cementitious mass within the ribbon 25 when it hardens.

As the ribbon 25 progresses, moisture is also taken up by the fibrous liners 10 and 20 from the slurry. Eventually the fibrous liners lose their stiffness and become limp and droop about the contours of the transversely lying slat 14. However, there always remains a "hump" 24 to the ribbon 25 immediately over the slat 14.

Since the fibrous ribbon 25 is still unset and it is necessary that the slats 14 be in intimate contact therewith the assembly is conveyed by and endless conveyor belt 26, running about pulleys 27. The middle section 29, is further supported with small rollers 30. Many unsuccessful attempts have been made to remove these "humps," but it was found un-

An expectedly that a vibrating means 32 imparting a vibrating motion to the plate 34 has proven to be very effective. The plate 34 lies parallel to the plane of the board, and is only in contact with the surface of the wallboard when it is vibrating. The whole assembly is mounted on a travelling type of a conveyor 36 which automatically raises the plate 34 and vibrator 36 from the surface of the ribbon 25 and restores to a predetermined previous position. Here it is lowered again over a hump 24, allowed to exert its influence, and then passed without engaging it for a distance of 18 inches of travel and then it repeats the cycle.

The repeated action of the vibrating means 32, irons out or flattens the protuberance 24 back into the plane of surface of the ribbon 25. The vibrating means 32 is mounted over the board stream at a point preferably where the initial set is just about to occur. The crystals forming in the "hump" are moved by the vibrating contact into the adjacent sections of the board core, and a smooth, uniform plane surfaced board is obtained.

In order to obtain a uniform appearing surface, it has been found that the vibratory force should be applied to an area within 8 inches about the surface directly overlying the slat. It has been further found that such force should be applied simultaneously while the ribbon is moving for a distance at least three feet.

Close to the end of the machine belt and after the core or slurry has taken the initial set the slats 14 are removed by conventional means 35, and allowed to accumulate in the receptacle 40 for re-use. The hardened ribbon 25 is then cut to desired lengths by the cutting knives 44, which are so set as to operate in synchronism with the slat removing means 38. The cutting means 44 cuts through the center of the recess 42 formed by the slat 14.

Though it is possible to have a number of various contours impressed into the surface of the unset board by varying the contour of the slat 14, it is desirable and preferable to have a contour impressed that is capable of receiving snugly the shape of the parp tape 46. This tape with perforations 48, fits snugly in the hollow formed by abutting recessed ends of a wallboard resting over a common support 52.

As previously mentioned a thin plastic adhesive is placed into the crevice and recess formed by the abutting ends or edges. A strip of tape 46 is embedded in the adhesive (not shown) which is forced through the perforations 48 to the surface. It is spread uniformly over the entire tape 46 and the edges 50 with a broad knife. The cement adhesive is allowed to set and then is further processed in the conventional manner to obtain monolithic wallboard wall construction.

It will be apparent that the removal of the "hump" or protuberance 24, by means of this invention provides a back surface that fits snugly and accurately against the flat surface of the supporting stud. Nails (not shown) may be driven without fear of damage or cracking of the wallboard.

Figure 3 illustrates a section of a wallboard made in the conventional manner and the "hump" in contact with the support 52. Obviously the rounded contour of the hump interferes with the proper positioning of the wallboard against the flat side of the stud. The distance 51, is the distance 51, plumb with the supporting studs and is the cause of waviness. In addition nails cannot be driven snugly for there is no adequate bearing surface.
The brunt of the impacting force of the hammer blows is taken by the head of the hump. Whereas in the improved type of this invention the force of the hammer blow is distributed over a wider area and against the entire stud surface instead of the hump portion.

As mentioned above the contoured transverse slats can be of any configuration and though for best results it is desirable to insert them beneath the fibrous liner after it has been formed, the slats, obviously, can likewise be passed under the bottom liner through the master rolls without departing from the scope of this invention.

Though there are a number of other advantages and merits in the use of this invention it is not intended to be limited to the preferred embodiments illustrated above for obviously these can be varied considerably by one skilled in this art, and still be within the spirit of the principles of this invention as expressed in the hereunto appended claims.

I claim:

1. In the process of forming an improved recessed end wallboard, comprising the steps of inserting transversely a supporting member having the desired surface configuration under an enclosed plastic cementitious mass whereby a surface transverse ridge overlying the said supporting member is formed, applying a vibratory force to the approximate area of the said transverse ridge surface over said supporting member for a sufficient length of time to reduce the said transverse surface ridge into a substantially uniform surface plane and allowing the mass to set whereby the surface configuration of the supporting member is retained by one side of the enclosed plastic mass and other is substantially plane.

2. The process of forming recessed end wallboard which comprises securing to the outer surface of a fibrous cover sheet at spaced intervals supporting members extending transversely of the said sheet, applying a plastic cementitious mass and a second fibrous cover sheet to said first cover sheet, shaping the plastic mass between said sheets to desired thickness whereby a transverse surface ridge is formed over the said supporting member, applying a vibratory motion to the said transverse surface ridge on the top cover sheet of said plastic mass for a period of time to reduce said ridge to the general plane of said shaped plastic mass, supporting said vibrated, formed board and said supporting members until said plastic mass has set, removing said supporting members and severing the formed board along said transverse depressions.

3. In the process of claim 1, the step of applying the vibratory motion shortly before the said plastic mass hardens.

4. In the process of forming an improved recessed end wallboard, comprising the steps of inserting transversely a supporting member having the desired surface configuration under an enclosed plastic cementitious mass whereby a transverse surface hump is formed over the said supporting member, applying a vibratory force to the transverse section of the area approximately within 8 inches on either side of the surface area directly over said supporting members for a sufficient length of time to reduce the said transverse surface hump to the general surface level and allowing the mass to set whereby the surface configuration of the supporting member is retained in intaglio by the set plastic mass.

5. In the process of claim 4, the additional step of simultaneously vibrating said transverse hump while said plastic mass is progressively urged forward.

THOMAS P. CAMP.

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