Title: METHOD AND APPARATUS FOR STUCCO PAPER SEPARATION

Abstract: A method and apparatus for separating a desired amount of paper from stucco. The stucco is made from a mixture of raw or synthetic gypsum and reclaim materials, which can include used gypsum wallboard. The paper removed from the stucco is cleaned and recyclable. The apparatus for processing the material containing gypsum includes a calcining unit for calcining the material into stucco, at least one screen to separate paper from the stucco, and structure for controlling the amount of paper separated from the stucco to obtain a desired paper content within the stucco.
METHOD AND APPARATUS FOR
STUCCO PAPER SEPARATION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a method and apparatus for producing stucco from a material containing gypsum and paper, and more particularly to a method and apparatus for removing excess paper from a material containing a mixture of gypsum rock, synthetic gypsum, and reclaimed gypsum wallboard materials.

Description of the Background of the Invention

Stucco is a base material used extensively in the construction industry. In particular, stucco is used to produce gypsum wallboard, a construction material for interior walls of buildings, which has applications as a partitioning and finishing material. The raw material used in the production of stucco is gypsum, which is typically handled in the form of rocks obtained from a quarry. Typically, the gypsum rock is crushed and ground to obtain powder called landplaster. The landplaster is then processed in calcining units, such as kettles, to produce stucco. Calcining is a chemical process occurring when the landplaster is heated up, whereby combined water is removed and the crystal structure of the material is altered to produce stucco.

Gypsum can also be obtained as a byproduct of certain industrial processes. For example, material removed from filters used to clean exhaust fumes of plants using high sulfur coal as a fuel and treated properly generates a form of gypsum. Gypsum is also a byproduct of industrial manufacturing processes using TiO₂. This type of gypsum obtained from industrial processes is commonly referred to as synthetic gypsum. It is not in rock form, but otherwise is processed in essentially the same way as natural gypsum during calcining. For clarity, mixtures containing one or both of the gypsum rock and synthetic gypsum will be referred to as raw gypsum.
Because gypsum is used in such large volumes in the construction industry, large quantities of reclaim material can be obtained easily and economically. Reclaim material includes gypsum wallboard panels, ceiling tiles, and other gypsum construction materials that contain stucco. In addition, gypsum wallboard products manufactured at the production facility but unsuitable for sale because of defects also are considered reclaim. These materials either do not meet standards for use in construction, have been already used in the construction of buildings that have been demolished, or for some other reason are not usable in construction. These large amounts of reclaim present a problem because they have to be disposed of, preferably without saturating available landfills. Often large amounts of reclaim are stored at the site of stucco manufacturing plants, where they occupy valuable land, and form rather unsightly large piles of reclaim. But the reclaim also presents economic opportunities since the stucco contained in the reclaim can be utilized to lower the manufacturing cost of new stucco, which can be further used to produce new construction materials.

It is a common practice to obtain reclaim material, break it into pieces of a size that can be easily handled, and mix it with the raw gypsum prior to the calcining step. In this manner, less raw gypsum will be required to produce a given amount of stucco, and the reclaim material so recycled to produce new stucco will not need to be disposed of in landfills. Reclaim materials, however, often contain components other than stucco, which are not necessarily desirable in the mixture of material that becomes new stucco. In particular, gypsum wallboard consists of a core sandwiched between parallel layers of paper. If too much reclaim material containing gypsum wallboard is used in the production of new stucco, the resulting new stucco will have an excessive concentration of paper. Excess paper in the stucco may jeopardize the end product's integrity with respect to fire resistance.
This situation is especially undesirable when the stucco is used to prepare gypsum wallboard or other building materials, because building materials used in constructing habitations and other buildings must have certain fire resistance characteristics. In fact, building materials have to conform to certain standards before they can be used. For example, local fire codes govern aspects of building construction that affect fire safety and other construction standards, and in particular the standards promulgated by the Underwriters Laboratories also generally have to be followed. Underwriters Laboratories is a leading third-party certification organization in the United States providing product evaluations and standards, including those relating to fire resistance capability of building materials. Other certifying bodies also perform similar functions. In view of these requirements and standards, it is important to control the maximum amount of paper that is included in the stucco used to manufacture building materials.

In conventional methods for production of stucco, the amount of paper included in the stucco is controlled by restricting the percentage of reclaim that can be used, together with raw gypsum, to make the new stucco. Typically, the reclaim material is processed into small pieces that are later blended with the gypsum rock. At this stage, the pieces of paper are still large enough that they can be removed with various screening systems. However, a system required to screen the paper out of the material at that point is expensive. It is also difficult to remove all product from paper in the system.

The reclaim material is typically stored outdoors, without protection from the elements. As a result, the reclaim when processed can contain 10% or more free moisture, which makes sifting of the material at this stage difficult. Because of the high reclaim water content which makes the material very sticky, the paper removed from the reclaim still contains a large amount of gypsum, and requires a further step to recover the usable material (i.e., stucco and clean paper). A facility could be used to dry the reclaim prior to
mixing it with raw gypsum, thus making it easier to handle. Then various screens could be used to separate most of the paper from the stucco. However, the drying equipment would be expensive. As a result, the conventional approach of using an external plant or system to separate paper from the material entering the stucco production plant is not optimal.

Several other approaches for removing paper from the reclaim material have been tried in an attempt to increase the amount of reclaim used in the process. Typical systems require the reclaim material to be blended with the raw gypsum, the mixture then being processed to remove paper prior to the grinding step, where the mixture is pulverized. The removed paper usually still contains a significant percentage of stucco, making it unusable for further use. Once the mixture reaches the grinding step, the paper is pulverized to a paper fuzz, which is not easily extracted from the blend. This approach is straightforward and less expensive than setting up a separate paper removal plant, or adding equipment, belts, and conveyors, but it has not been successful for removing paper. Because the paper cannot be easily extracted prior to grinding, only a small percentage of reclaim material can be added to the raw gypsum before the paper content of the stucco produced exceeds the requirements for fire resistant gypsum products.

None of the conventional methods used to produce stucco from raw gypsum and reclaim material allow for a large percentage of reclaim material to be used, while resulting in products containing a low enough percentage of paper that meets applicable fire codes and standards, such as the Underwriters Laboratories standards for fire resistance. In addition, the conventional separation methods often rely on machinery located near the reclaim storage piles, typically outdoors or with minimal protection from the elements.
SUMMARY OF THE INVENTION

In order to maximize the usage of recycled gypsum, or reclaim, while still maintaining the standards of fire resistance promulgated by various certifying bodies and mandated by fire codes, the stucco paper separation system of the present invention was developed with the goal of removing paper fiber from the stucco so that a greater proportion of reclaim could be used without exceeding a given percentage of paper in the stucco, and so that the paper extracted could be essentially free of stucco and suitable for further uses.

To achieve these results, one aspect of the invention is thus a method for producing stucco from a material containing gypsum and paper including the steps of crushing the material to a size suitable for calcining, calcining the material to obtain stucco, and screening the stucco to remove paper. As used in the present method, the material can be reclaim or can be reclaim and raw gypsum mixed together. Prior to calcining, the material can be pulverized. The method can also comprise, after the screening step, a step for separating any residual stucco from the paper removed. The residual stucco can be separated using a vibratory screen. An air vortex screen can be used to screen paper from the stucco in the screening step.

In yet another aspect, the invention is a method for producing stucco from reclaim, the method having the steps of forming a mixture of reclaim and raw gypsum, crushing the mixture, pulverizing the crushed mixture to a size suitable for calcining, calcining the mixture to obtain stucco, and then screening the stucco to remove paper from the stucco so that a shaped element can be formed with the screened stucco.

Another aspect of the invention is an apparatus for processing a material containing gypsum. This apparatus has at least one calcining unit for calcining the material into stucco, at least one screen to separate paper from the stucco, and means for controlling the amount of paper separated from the stucco to obtain a desired paper content of the stucco.
It is to be understood that both the foregoing general description and the following detailed description of the invention are exemplary and explanatory, and are intended to provide further explanation of the invention as claimed.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The accompanying drawings are included to provide further understanding of the invention and are incorporated in and are considered part of the specification, illustrate one embodiment of the invention, and together with the description serve to explain the principles of the invention.

In the drawings:

Fig. 1 is a schematic diagram showing the process for separating paper from stucco discharged from a calcining unit, according to one embodiment of the invention.

Fig. 2 is a cross-sectional diagram showing a centrifugal screen and associated machinery according to one embodiment of the invention.

Reference will now be made in detail to preferred embodiments of the invention, examples of which are described herein and illustrated in the accompanying drawings. While the present invention can be broadly applied to the field of production of stucco from materials containing gypsum and paper, it is especially well suited for use in the production of stucco from raw gypsum and reclaimed gypsum wallboard materials.

**DETAILED DESCRIPTION OF THE INVENTION**

The stucco production process preferably starts by mixing reclaimed gypsum with crushed raw material, in the form of gypsum rock and synthetic gypsum, which are then fed into the grinding stage where the mixture is pulverized. It is also possible to add the reclaim before the crushing step, prior to calcining, without affecting the results of the process. The mixed material is then fed to one or more calcining units, where heat is applied, the calcining reaction takes place, and the mixed material is turned into stucco.
The stucco then enters the screening system, which is installed downstream of each calcining unit.

The location of the screening apparatus, according to the invention, confers several advantages. The machinery is indoors, within the existing building that houses the calcining units. As a result, there is no need to construct any additional buildings to protect the screens and their operators from the elements, or to leave the screens unprotected. The screens are located between the outlet of the calcining units and the inlet of the hot pits, and there is no need to re-route the flow of stucco to a different location to perform the sifting. It is also unnecessary to move either the calcining units or the hot pit to accommodate the screens, thus avoiding additional costs. The entire paper sifting apparatus can be easily retro-fitted to an existing plant with a minimum amount of construction or disruption of the existing process. An additional screening step may be added before the mixing stage to take away some of the larger pieces of paper, thus reducing the workload of subsequent screening stages.

After the calcining stage, the stucco passes through the screen and enters the hot pit, while the separated paper fiber is discharged. One or more screens separate the paper from the stucco and discharge the paper into a conveyor. The screened stucco is discharged to a hot pit for further processing. The conveyor discharges the paper into another screen separator for secondary cleaning, where most remaining stucco is removed from the paper. The stucco passing through the secondary screen returns to the process, while the cleaned paper is directed to further storage and handling. The system can operate continuously as long as any of the calcining units are operating.

After the separation steps, the cleaned paper can be sold, for example, to recycling enterprises since it is substantially free of gypsum. The screening system according to the invention does not disrupt the normal operation of the plant and does not need a separate paper separation plant or system, which
would require much larger capital investment. In addition, this process is environmentally compatible because a large percentage of reclaim stucco is reused to produce new gypsum products, and the paper that is removed from the calcined stucco can be recycled for other purposes. Both of these results reduce the amount of waste that would otherwise be destined for already overcrowded landfills.

Screening after calcining advantageously makes all subsequent separation steps more efficient. Although heating the paper together with the gypsum and reclaim in the calcining units may increase the use of energy, any increased costs due to heating are offset by the ease with which separation occurs, as well as reducing the amount of raw gypsum required.

The amount of paper that is removed from the stucco after calcining can be controlled in several ways. For example, a diverter valve can direct the flow of stucco from the calcining units either to the hot pit or to the screen where the paper is separated from the stucco before the stucco is allowed to proceed to the hot pit. Additionally, an air regulator can meter the amount of air going through the center of the centrifugal screen to vary the amount of paper removed.

Another aspect of the invention is an apparatus for processing a material containing gypsum, having at least one calcining unit for calcining the material into stucco, at least one screen to separate paper from the stucco, and means for controlling the amount of paper separated from the stucco to obtain a desired paper content of the stucco. The means for controlling the amount of paper separated can include the diverter valve to direct the stucco to bypass the screen, a regulator to control the flow of cleaning air through the screen, and also a venting source with damper control for the discharge side of the screen. The screen can be a centrifugal screen, containing a plurality of paddles for accelerating the stucco and paper against the screen and wipers to remove contaminants from the screen. Additionally, the screen can comprise jets of air to remove contaminants from the screen and to
aerate the stucco, preventing it from settling at the bottom of the screen. The apparatus can also include a vibratory screen separator for removing any residual stucco from the paper that was separated by the centrifugal screen. The shaped elements made with the screened stucco can be gypsum wallboard or any other type of building elements. The screening step preferably includes a mechanism for controlling the amount of paper removed from the stucco.

Referring to Fig. 1, a set of four kettles 10 are shown into which a mixture of raw gypsum, crushed to the appropriate size, and of reclaim material, consisting of broken down gypsum wallboard and other construction materials containing reclaimed gypsum, are mixed together and heated to an appropriate temperature to achieve calcining. The actual number of kettles can vary and depends on the amount of throughput that is expected from the plant. Prior to entering the kettles, the raw gypsum is crushed and ground to a powder by a grinding apparatus not shown in the drawings. The gypsum wallboard and other components of the reclaim material can also be broken down, in any known manner, to smaller pieces that can be handled more easily. The broken down reclaim material is mixed with the raw gypsum and goes through the crushing and pulverizing steps together with the raw gypsum before entering the kettles.

During calcining, energy in the form of heat is added to the material in the kettles, to remove combined water from the gypsum, and change the crystal structure of the material to produce stucco. In a preferred embodiment described, the calcining stage occurs in kettles. However, other types of devices could be utilized to carry out the calcining stage of the process, such as a calcidine, a Claudius Peters mill, an Imp mill, a rotary kiln, or a flash calcining device, among others.

Preferably, the ground mixture commonly referred to as land plaster is continuously fed into each kettle 10 at a rate equal to the outflow rate of stucco. Each kettle comprises a large vessel containing the calcining
material, which is kept at a predetermined temperature (e.g., 305°F) by a fire box at the base of the kettle. As the material is heated, combined water is released as vapor and the material rises and overflows from the kettle in the form of stucco. When the stucco exits the kettle, it is dry and has flow characteristics that facilitate subsequent steps of sifting out of the shredded paper. From the kettle, the stucco goes through a diverter valve 14. Diverter valve 14 selectively directs the outflow from the kettles 10 into one of two flow paths. Passage 16 takes the stucco through a rotary airlock 17 and then to a centrifugal screen 20 (single or multiple), where paper is sifted out of the stucco. Alternatively, diverter valve 14 can direct the flow of stucco to bypass passage 18, which bypasses the centrifugal screen 20 and takes the stucco directly into a hot pit 22.

Since no paper is removed from the flow that bypasses centrifugal screen 20 via bypass passage 18, the amount of paper contained in the final stucco product can be controlled by operating diverter valve 14 to selectively direct the kettle outflow toward centrifugal screen 20 via passage 16, or to the hot pit 22 via bypass passage 18. Any appropriate method of monitoring the amount of paper in the stucco present in the hot pit 22 can be utilized to determine the required operation of diverter valve 14. The rotary airlock 17 located immediately preceding the screen 20 regulates the feed of material entering screen 20, as well as isolates the screen from any upstream venting sources. One advantageous feature of this design is that the screening of paper from the stucco can be performed without interrupting the manufacturing process of the stucco and without adversely affecting the production rate of stucco of the entire plant.

Referring to Fig. 2, details of the centrifugal screens will now be described. Centrifugal screen 20 can be, for example, a Kason model YOB- CS or Kason KO-SS centri-sifter screen. These screens are available in a variety of sizes for different flow rates. The centri-sifter screen is a totally enclosed, high-capacity centrifugal scalper designed to process a wide variety
of powder materials, even materials of poor flowability. The screen includes rotating paddles to break up soft agglomerates and propel individual particles through the screen, while rejecting oversized pieces of material. Single or twin models of this screen are available. The stucco is introduced into each centrifugal screen 20 through a passage 16 and rotary airlock 17 which drops the material into a rotating helical paddle assembly 24 (such as a four paddle assembly). Centrifugal force, due to the paddle assembly 24, accelerates and aerates the stucco, pushing it against a screen 26. The rotating paddles 24 propel the material through the entire length of the screen 26, so that the entire surface area of the screen is utilized. Oversized particles and paper fibers are thus rejected by screen 26, exiting the discharge spout of the screen 26 where they are further directed to a paper collection screw 28. The stucco, now containing a substantially reduced amount of paper, exits the centrifugal screen 20 through opening 30 and is directed to hot pit 22.

Stainless steel adjustable wipers 32 are preferably set very close to, but not touching the screen 26, and help keep the screen surface clear of debris. Wipers 32 can be mounted on rotating paddles 24. The surface of screen 26 is also kept clean with the use of compressed air sprayed from the center shaft of the paddles and through the screens. The sprays of air are activated at time intervals and at a regulated pressure determined to optimally remove debris from the screen 26. For example, the size of screen 26 preferably ranges from 8 to 20 mesh. More preferably, the size of screen 26 ranges from 12 to 14 mesh, and most preferably 14 mesh. The air used for the cleaning spray should preferably be dry, to avoid mechanical difficulties in the process.

A damper 34 containing a throttle valve 36 can be located in the air flow outlet 60 of the hot pit 22 and can be used to modulate the amount of draft carrying the stucco and paper through the centrifugal screen. This affords a further control on the amount of paper being removed by the centrifugal screen. In addition, the draft through the air flow outlet 60 and the
vent pipe 62 will absorb excessive moisture and properly vent the screen to avoid clogging. In a preferred embodiment, the amount of draft from the kettle through vent pipe 62 and from the screen through outlet 30 can be controlled independently, to maintain a set negative pressure and avoid screen clogging.

The stucco in the hot pit, after screening, preferably contains less than 12 pounds per thousands of square feet (MSF) of paper. More preferably, the stucco in the hot pit has a paper content of between 8 and 10 pounds per MSF, however, other desirable paper contents can be achieved with the method of the invention. The stucco in the hot pit is thus suitable for use in the construction of new gypsum wallboard. This is accomplished by sandwiching a slurry containing stucco and other materials between parallel layers of paper. The stucco can be used to make other construction materials, since its paper content can be easily controlled in a way to meet the requirements of fire codes or construction standards, such as the Underwriter Laboratories quality standards for construction materials.

In one embodiment of the invention, the paper separated from the stucco in centrifugal screen 20 is deposited in the paper collection screw 28 for collection and further processing. Paper collection screw 28 can be a screw type conveyor or any other suitable type of conveyor system. Screw 28 collects the paper removed from the stucco by all of the centrifugal screens, and transports it to a vibratory screen 38 for further separation of any remaining stucco that is mixed with the separated paper. The purpose of vibratory screen 38 is to obtain paper that is substantially free of gypsum and/or stucco, so that the paper is clean enough to be recycled. The vibratory screen 38 can preferentially have a mesh size ranging from 8 to 20 and can produce paper that is substantially free of stucco. In a more preferred embodiment, the vibratory screen 38 can have a mesh size ranging from 14 to 16, and most preferably 14. The vibratory screen can be, for example, a Kason K24-1-SS model. Other suitable types of screens to
remove the remaining stucco and gypsum from the paper could also be used. This vibratory screen is a high efficiency vibratory separator designed to maximize screen utilization and handle widely varying feed rates and consistencies, while preventing screen binding. A variable number of screen surfaces permits accurate separation of up to six predetermined fractions of material.

After removal by the vibratory screen 38 (Fig. 1), the remaining stucco is carried by conveyor 40 back to the process. It can be re-introduced at the hot pit, the kettle, or any other part of the process. The paper leaving the vibratory screen 38 is substantially free of stucco and is carried along a conveyor 42 to a compactor or dump box 44 where it is compacted and stored for subsequent applications (e.g., recycling). Diverter 46 is located adjacent conveyor 42 to redirect the paper coming from vibratory screen 38 into hopper 48 when the compactor 44 is being emptied or has other maintenance being performed. By using this arrangement, the paper separation process can proceed continuously without having to stop for unloading of the paper collected in compactor 44 or for other maintenance reasons. The output paper of this process, after the vibratory screen step, preferably results in paper that can be over 90% or even 95% free of gypsum and/or stucco.

The screens 26 used in the centrifugal screens 20 are preferably made of stainless steel wedge wire and are designed to resist high temperatures and plugging by the stucco and paper being filtered. The diverter valve 14 is pneumatically controlled by a solenoid valve and can have a manual override to direct the gypsum to the hot pit 22. Inspection doors are provided on the diverter valve housing and on the centrifugal screen for cleaning and maintenance. Each inspection door is preferably connected to an interlock switch that cuts power to the machinery when the door is opened.

The various components of the apparatus can be controlled manually, however, the preferred method of operation is under control of a
programmable logic controller (PLC). The screens, vibratory screen, and the compactor have switches 50 with the settings of jog, off, and auto. In addition, there are emergency stop buttons that stop all of the machinery in case of an emergency. The jog setting allows for manual operation of the components, and the auto setting gives control to the PLC. The switches 51 of the conveyors also have an additional reverse setting, which allows for operation in reverse for cleaning and maintenance functions.

In case the material from all the kettles has to be diverted from the normal process stream, a reject bin is provided to temporarily hold the output of the kettles. This situation could arise if too much unscreened stucco is released to the hot pit, for example, because of failure of the vortex screens, or if too much paper is present in the reclaim. Once the situation is corrected, the material in the reject bin can be blended back in the process and screened in the normal manner. Alternatively, an additional screen discharging stucco to one of the hot pits 22 and paper to screw 28 can be dedicated to sift the material in the reject bin.

Several test runs were conducted to evaluate paper separation from the stucco, using a small Kason Centri-Sifter centrifugal screen connected in series with a small single deck vibratory screen, equipped with various mesh screens. These tests were conducted on a smaller scale than what would be used in a production plant. The first run was conducted with a 18 mesh wedge wire screen in the centrifugal screen and a 6300 lbs/hr feed rate. In this run, 19.8% of the feed stock was discharged as oversized, and forwarded to the vibratory screen unit, where 2.1% of the material was removed as oversized. In a second run, a 12 mesh stainless steel screen was used, using a feed rate of 8715 lbs/hr. In this case, 1.65% of the feed stock was sent on to the vibratory screen as +12 mesh oversize, of which 16.2% was sifted as oversized. In a third test, a 10 mesh nylon screen was used with a 9400 lbs/hr feed rate. The oversize discharge for this run was 0.15%, which
again was sent to the vibratory screen, where 90.9% of the material was sifted as oversized.

The tests showed that the 18 mesh screen removed mostly stucco, with only a small amount of paper being removed. The 12 mesh screen discharged much less material, and of that material 16.7% was paper. The 10 mesh screen resulted in a very small amount of material removed, most of which was paper. Although each design tested successfully separated paper from stucco, a 14 mesh screen was chosen as being the preferred choice for the centrifugal screen mesh in the preferred embodiment of the invention.

However, the actual preferred mesh size varies for each application, depending on what type of reclaim is used (age, moisture content, size of pieces, paper content), feed rate, and on the required paper content of the final product. Accordingly, the 14 mesh screen should be considered a preferred screen size only for the application implemented in this test.

An industrial scale test of the invention was also carried out. In this test, the paper separation was performed in a plant processing approximately 40 tons of stucco per hour, or 960 tons per day. The material entering the process consisted of approximately 12% reclaim, corresponding to about 115 tons of reclaim per day. Under those conditions, the stucco reaching the primary screens contained about 9 lb. of paper fiber per ton of stucco.

In the industrial scale test, the primary screening apparatus according to the present invention removed approximately 74% of the paper fiber contained in the stucco. The remaining 26% of paper fiber remained in the stucco that was directed to the hot pits. The primary screening step was carried out utilizing centrifugal screens operating with 14 mesh wedge wire screens. The 74% of paper removed during primary screening also contained a certain amount of stucco. The paper was thus further processed in a secondary screening step to remove any remaining stucco from the paper. The stucco was then re-introduced in the process and the paper was, for example, available for recycling. A vibrating screen was used in the
secondary screening, having a 14 mesh screen. About 12% of the flow reaching the vibratory screen was removed as stucco, and re-introduced in the process either in the hot pit or any other suitable point.

The present invention achieves all the multiple objectives that were intended. A large proportion of reclaim material can be used, together with raw gypsum, to obtain stucco that has a paper content low enough to meet the requirements of various building codes and the performance standards of certifying bodies, such as ASTM and the Underwriters Laboratories. A more economical production of stucco usable for construction materials is obtained, and a smaller volume of non-usable stucco-based materials has to be sent to disposal sites, thus providing economic and environmental benefits. In addition, the paper removed from the stucco is substantially free of stucco contaminants and can be sold for recycling, conferring a further economic advantage.

It will be apparent to those skilled in the art that there are modifications and variations that can be made in the structure and method of the present invention, without departing from the spirit or scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.
WHAT IS CLAIMED IS:

1. A method for producing stucco from a material containing gypsum and paper, comprising the steps of:
   crushing the material to a size suitable for calcining;
   calcining the material to obtain stucco; and
   screening the stucco to remove paper.

2. The method according to claim 1, wherein the material includes reclaim.

3. The method according to claim 1, wherein the material is a mixture of reclaim and raw or synthetic gypsum.

4. The method according to claim 1, wherein the material is pulverized prior to calcining.

5. The method according to claim 1, wherein the screen is a centrifugal screen.

6. The method according to claim 1, wherein the screen is an air vortex screen.

7. The method according to claim 1, wherein the screen has a mesh size ranging from 8 to 20.

8. The method according to claim 1, wherein the screen has a mesh size of 14.

9. The method according to claim 1, further comprising, after the screening step, separating any residual stucco from the removed paper.

10. The method according to claim 9, wherein the residual stucco is separated using a vibratory screen.

11. The method according to claim 10, wherein the vibratory screen has a mesh size ranging from 8 to 20.

12. The method according to claim 10, wherein the vibratory screen has a mesh size of 14.

13. The method according to claim 1, wherein the paper removed is substantially free of stucco.
14. The method according to claim 1, wherein the screened stucco is substantially free of paper.

15. Apparatus for processing a material containing gypsum comprising:

5 at least one calcining unit for calcining the material into stucco;

10 at least one screen to separate paper from the stucco; and

means for controlling the amount of paper separated from the stucco to obtain a desired paper content within the stucco.

16. The apparatus of claim 15, wherein the calcining unit is a kettle.

17. The apparatus of claim 15, wherein the calcining unit is one of a calcidine, a Claudius Peters mill, a rotary kiln, an Imp mill, and a flash calcining device.

18. The apparatus of claim 15, wherein the means for controlling the amount of paper separated comprise a diverter valve to direct the stucco to a bypass around the screen.

19. The apparatus of claim 15, wherein the means for controlling the amount of paper separated comprise a damper modulating an amount of draft carrying stucco and paper through the screen.

20. The apparatus of claim 15, wherein the screen further comprises a plurality of paddles for accelerating the stucco and paper against a screen and wipers for removing contaminants from the screen.

21. The apparatus of claim 15, wherein the screen further comprises jets of air to remove contaminants from the screen.

22. The apparatus of claim 15, further comprising a vibratory screen separator for further separating stucco from the paper separated in the screen.

23. The apparatus of claim 21, wherein the screen is a centrifugal screen.

24. The apparatus of claim 15, further comprising means for controllably venting vapor from the calcining vessel.
25. A method for producing stucco from reclaim, comprising the steps of:
   forming a mixture of reclaim and raw or synthetic gypsum;
   crushing the mixture;
   pulverizing the crushed mixture to a size suitable for calcining;
   calcining the mixture to obtain stucco;
   screening the stucco in a centrifugal screen to remove paper from the stucco; and
   forming a shaped element with the screened stucco.

26. The method according to claim 25, wherein the shaped element is gypsum wallboard.

27. The method according to claim 25, further comprising the step of removing paper before mixing reclaim and raw or synthetic gypsum.

28. The method according to claim 1, further comprising, prior to the step of screening the stucco to remove paper, the step of controlling the amount of paper removed from the stucco by the use of a rotary airlock located prior to the screen.

29. The apparatus of claim 15, wherein the means for controlling the amount of paper separated comprises a rotary airlock located prior to the screen.

30. The apparatus of claim 29, wherein the rotary airlock is configured to regulate the feed of stucco entering the screen.

31. The apparatus of claim 30, wherein the rotary airlock is configured to isolate the screen from any upstream venting sources.

32. The apparatus of claim 19, wherein the means for controlling the amount of paper separated further comprises a rotary airlock located prior to the screen, the rotary airlock regulating the feed of stucco entering the screen.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C04B11/26  C04B28/14  //C04B28/14,18:16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>EP 0 916 628 A (RIGIPS GMBH) 19 May 1999 (1999-05-19) paragraph '0014!' - paragraph '0017!'; claim 1</td>
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Date of the actual completion of the international search: 20 September 2000
Date of mailing of the international search report: 29/09/2000

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