Jan. 17, 1967 E. VEVODA 3,298,886

PROCESS AND APPARATUS FOR MANUFACTURING MOSAICS

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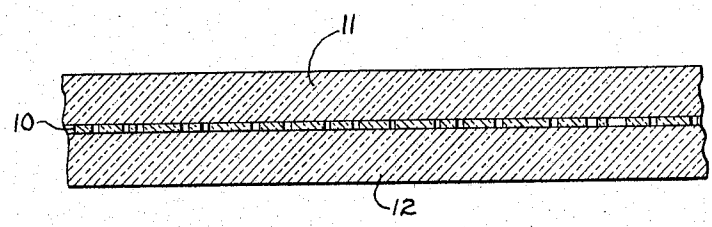


Fig. 1

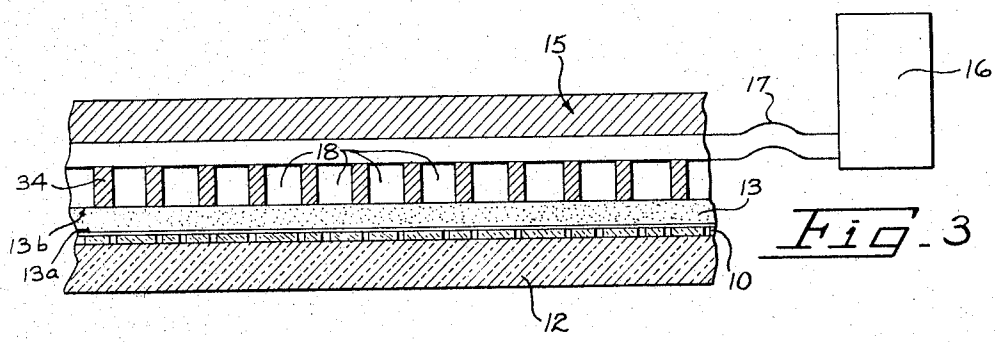


Fig. 3

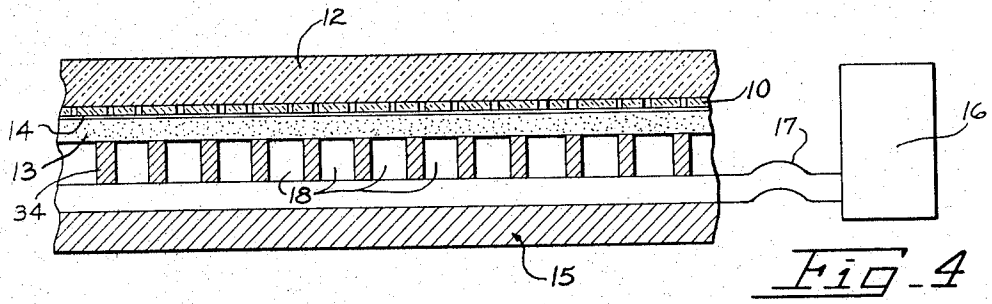


Fig. 4

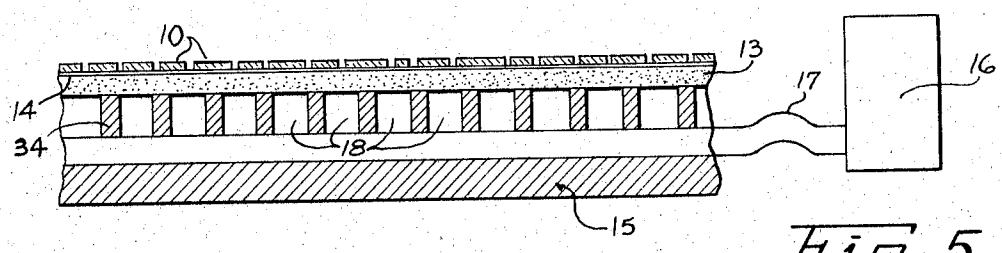


Fig. 5

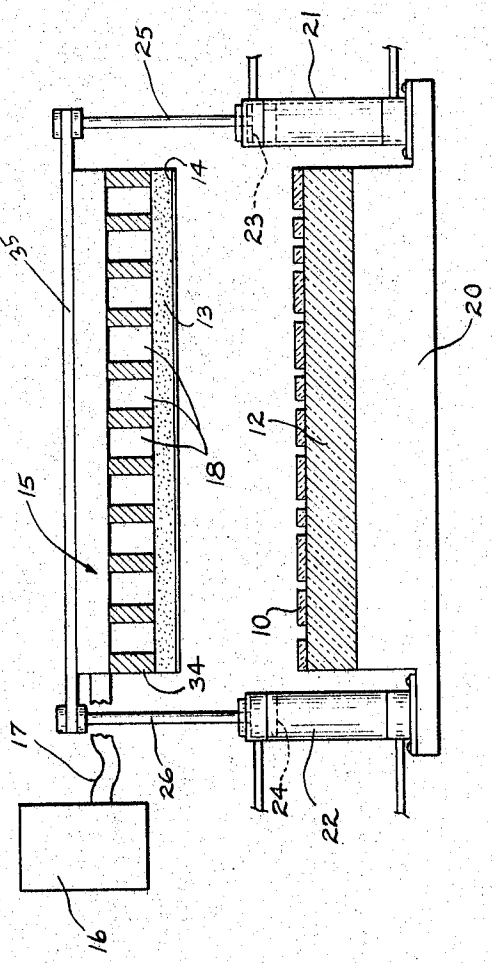
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PROCESS AND APPARATUS FOR MANUFACTURING MOSAICS

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Fig. 2



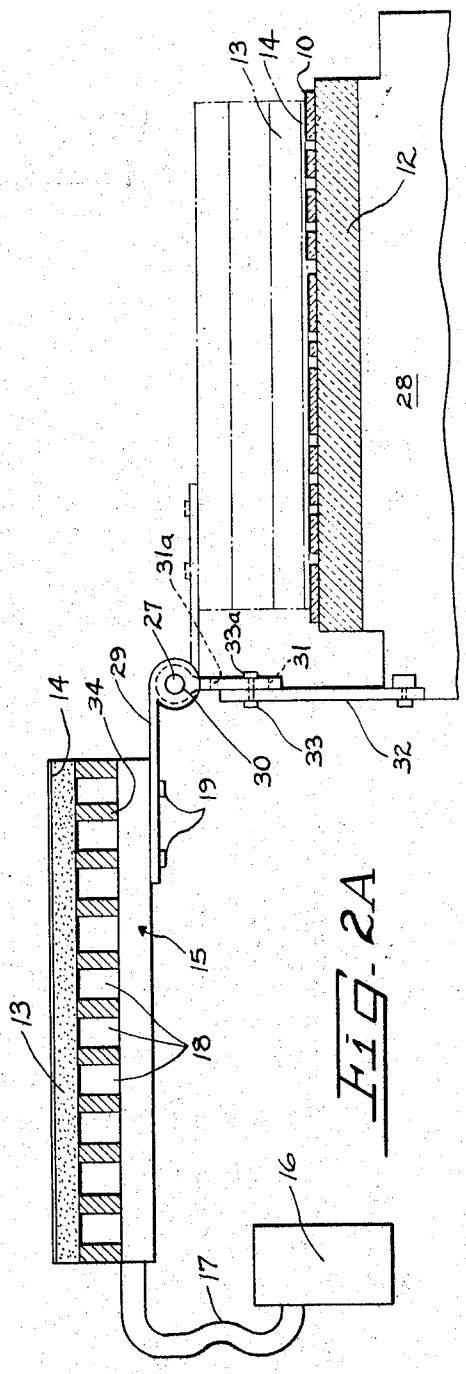


Fig. 2A

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PROCESS AND APPARATUS FOR MANUFACTURING MOSAICS

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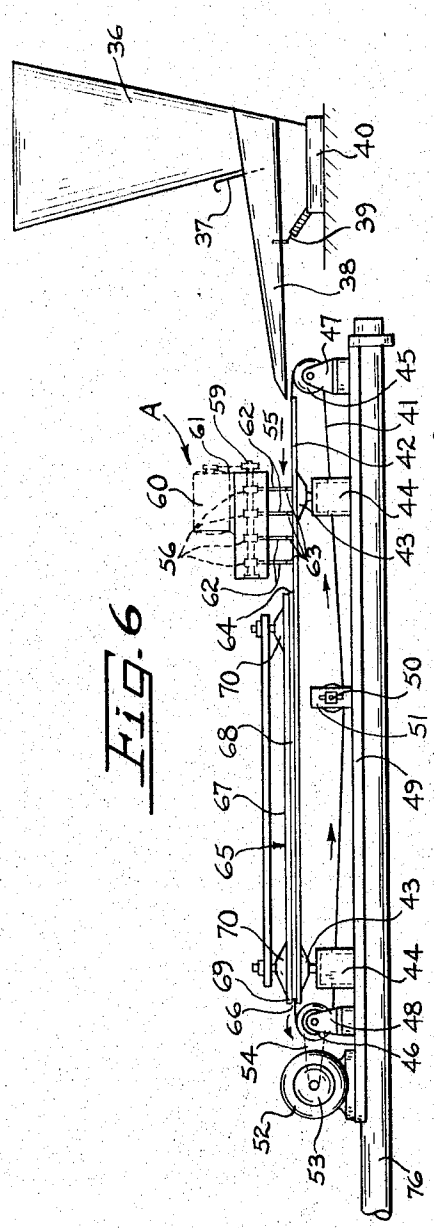


Fig. 6

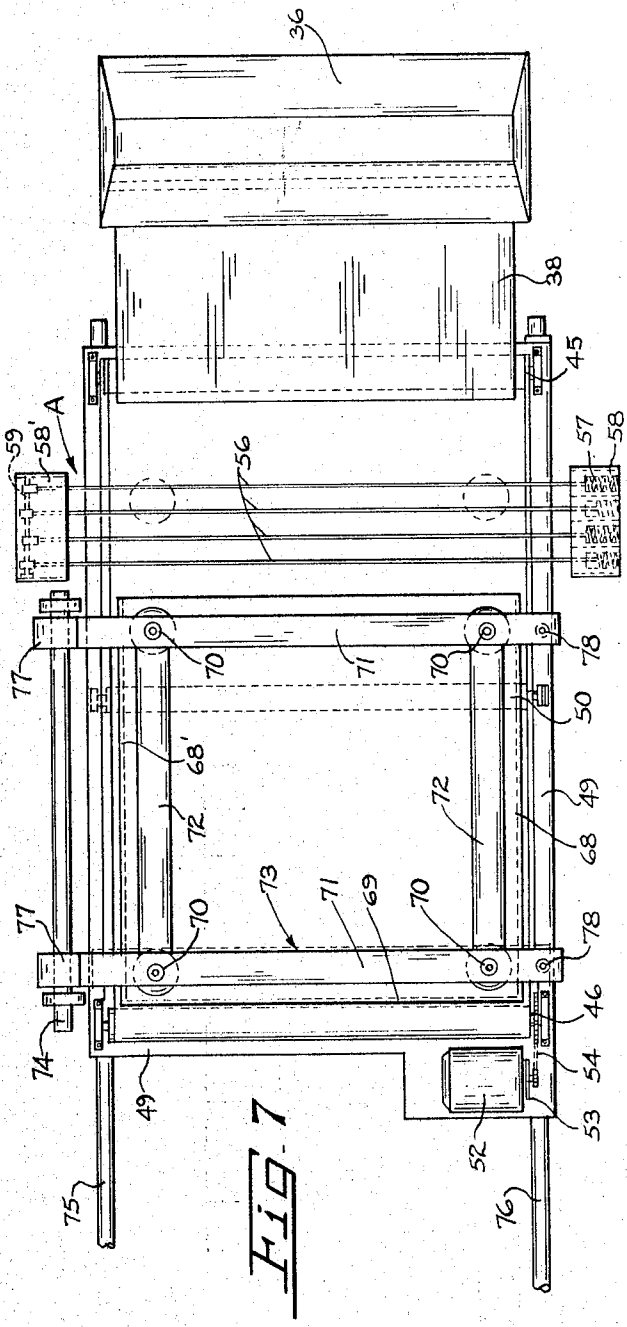


Fig. 7

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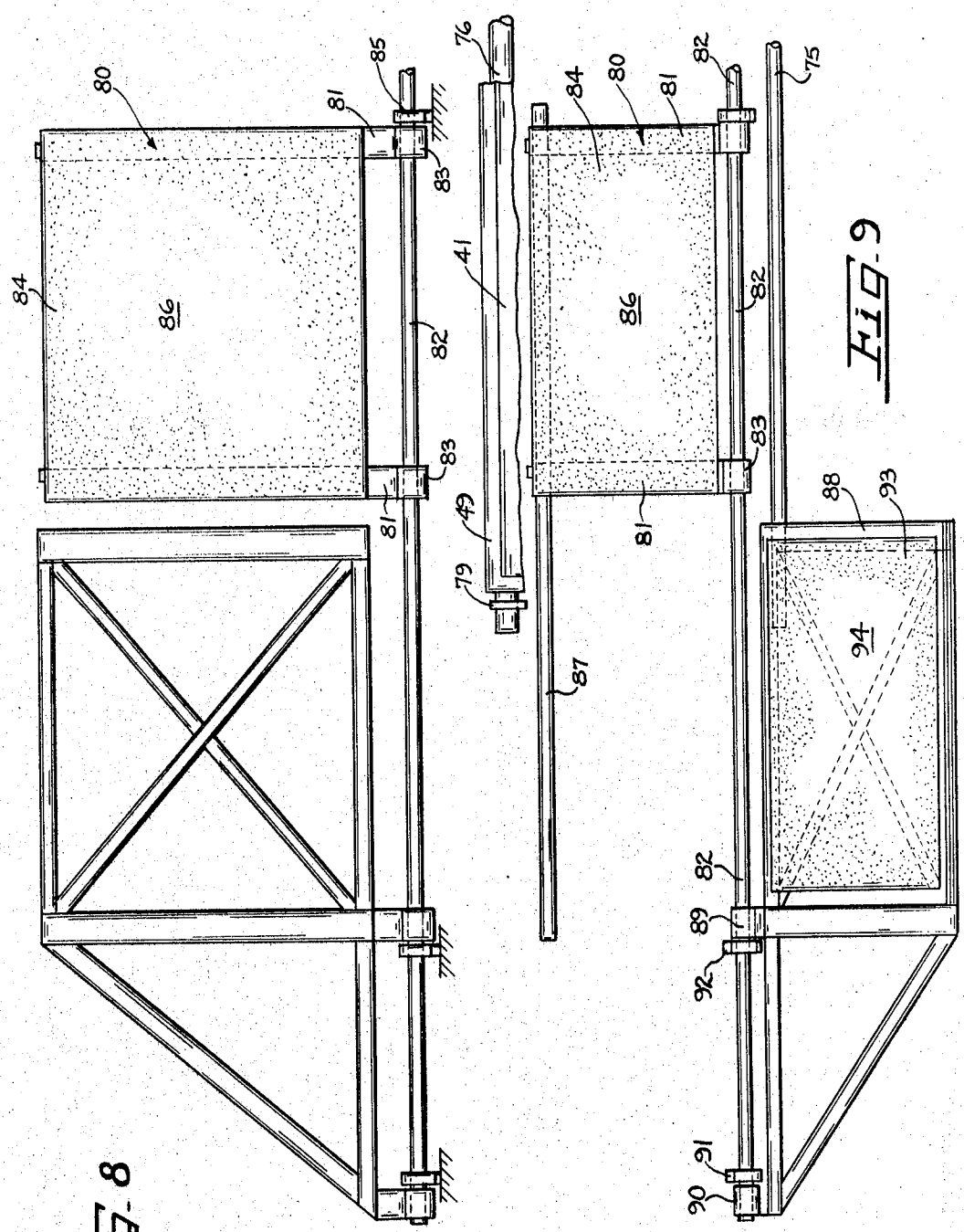


Fig. 9

Fig. 8

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3,298,886

PROCESS AND APPARATUS FOR MANUFACTURING MOSAICS

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Filed Feb. 4, 1963, Ser. No. 255,894
3 Claims. (Cl. 156—285)

This invention relates to the manufacture of mosaics. More particularly it relates to an improvement in the method for arranging mosaic chips into a mosaic pattern and for affixng the permanent substrate or backing to the individual chips or tiles. It also relates to apparatus for doing the same.

Previously, it has been the practice in making mosaics to arrange the mosaic chips in the desired pattern in a single plane and then apply a temporary backing such as kraft paper to one surface of the mosaic chips with an adhesive. The chips with the temporary backing were then turned over and eventually a permanent backing was applied to the other surface of the chips.

This two-step procedure was necessary because before the chips are attached to some type of substrate, they are subject to dislocation by any slight movement. For example, one of the common types of permanent backing employed is a cement asbestos board. If the chips had heretofore not been first fixed in relative positions by adhesion to a temporary backing paper, when the cement asbestos board was placed in position against the chips, some of the chips would become dislocated and cause disarray to the mosaic pattern. This is due to the fact that the cement asbestos board is normally flexible and it has not been possible to place the board in contact with all of the mosaic chips simultaneously. The contact of the board against some of the tiles would jar the remaining tiles out of their appropriate positions before being contacted with the board. On the other hand, when a temporary backing such as kraft paper is employed, the extreme flexibility of the paper permits its positioning on the chips without disturbing the mosaic pattern.

This prior two-step procedure has several disadvantages. First, as the term implies it involves two steps and is, therefore, both costly and time-consuming as compared with a single step procedure where the permanent backing is applied directly to the chips. In addition, where the two-step procedure with the temporary backing is employed, the temporary backing must ultimately be physically removed to expose the finished mosaic. In effect then, the two-step procedure requires three steps with the third step comprising removal of the temporary backing. Further, with this two-step laminating combination, there is a danger of air entrapment when the permanent backing is applied while the kraft paper is still in place on the opposite side of the chips. This can lead to a poor bond between the chips and the permanent backing. Finally, the two-step method requires two different coats of laminating resin or the like—one for the the temporary backing and the other for the permanent backing.

The present invention avoids the disadvantages of the prior practices in that it permits the direct positioning of the permanent backing against the mosaic chips without the necessity of using and subsequently removing a temporary backing material. The gist of this aspect of the present invention lies in supporting the permanent backing parallel to the chips substantially uniformly over its surface so that all of the ceramic chips simultaneously contact the permanent backing. As a result, none of the chips are jarred out of position by piecemeal contact between the chips and the backing.

The present invention also provides a new way for positioning the individual mosaic chips into a single plane or layer to define a mosaic pattern so that the permanent backing member may be affixed thereto by the aforementioned technique or by any other. The method and apparatus for accomplishing this end is characterized by speed made possible by semi-continuous operation, and efficiency in arranging the chips in proper location without jamming.

Thus in the preferred embodiment of the present invention, there is provided an improved method of forming mosaics including the steps of positioning a plurality of mosaic chips in a common plane to define a mosaic pattern by providing a controlled flow of chips onto a moving web in a single layer and providing a tunnel having one closed end and a height approximately equal to the thickness of the layer of chips. The web with the chips resting thereon is moved through the tunnel along its bottom end under the closed end thereof so that the chips on the web are stopped by the closed end of the tunnel and retained therein. The closed tunnel end and the chips initially stopped also serve to stop subsequent chips moved by the web while the impact of chip upon chip and tunnel serve to shift the chips into a closely spaced mosaic pattern on the web. The mosaic pattern on the web is then transferred from the web to a generally flat horizontal surface. A permanent normally flexible backing member is provided having opposing first and second flat surfaces and adhesive on the first flat surface thereof. The backing member is supported substantially uniformly over its second flat surface with a vacuum plate so that said entire first flat adhesive surface lies substantially in a single plane. The first flat adhesive surface is moved, while continuing to support the backing member, parallel to the mosaic pattern on the horizontal surface and into parallel bonding contact therewith. The chips may then be further caused to adhesively unite themselves in fixed mosaic pattern to said first flat adhesive surface. Further, as in prior procedures, cementitious grouting may be placed between the chips along with other conventional finishing steps.

The foregoing method, and apparatus provided by the present invention that is suitable for use with the method, are more specifically illustrated in the accompanying drawings where there is shown in FIG. 1 schematically in side section, part of a pair of glass plates for positioning the mosaic chips in a single plane with chips therebetween.

FIG. 2 shows schematically in side section, apparatus for practicing the present method including the means for moving the mosaic backing into position against the mosaic chips.

FIG. 2*a* shows schematically in side section an alternate embodiment for positioning the backing against the chips.

FIG. 3 shows schematically in side section the position of part of the vacuum plate after the backing has been moved into contact with the mosaic chips.

FIG. 4 shows schematically in side section the apparatus of FIG. 3 but wherein the apparatus is turned upside down.

FIG. 5 shows schematically in side section part of a mosaic in position on permanent backing after both glass plates have been moved.

FIG. 6 shows schematically in side elevation a portion of the present apparatus for making mosaics relating to the positioning of individual chips into a mosaic pattern occupying a single layer.

FIG. 7 shows schematically a top view of the apparatus illustrated in FIG. 6.

FIG. 8 shows schematically in side elevation that portion of the present apparatus to be joined to the left side

of the apparatus of FIG. 6 and including the swingable surface for transferring chips from the conveyor belt and a vacuum belt similar to that illustrated in FIG. 2*a* for cooperation with the swingable surface.

FIG. 9 shows schematically in top elevation the apparatus of FIG. 8 and particularly illustrates the pivoting of the transfer surface and vacuum plate.

The aspect of the process dealing with the direct joining of the permanent backing in one step to the mosaic pattern is illustrated particularly in FIGS. 1–5. A plurality of glass or ceramic or other suitable type of mosaic chips **10** are confined within a single plane and arranged in a mosaic pattern. One specific method for so arranging these ceramic chips **10** is illustrated by FIGS. 6–9 and will be described in detail hereinafter. However, any technique for accomplishing the desired arrangement may be employed.

In the embodiment illustrated in FIGS. 1–5 the chips **10** are confined in a single plane between two glass plates **11** and **12**. It should be obvious that the plates need not be glass but may be any rigid plates suitably having polished planar surfaces and also having the necessary resistance to abrasion and a low coefficient of friction. The chips **10** may be disposed between the glass plates **11** and **12** by the process described and illustrated in United States Patent No. 2,949,689 to Vida patented August 23, 1960.

After the chips **10** have been disposed in one common plane as in FIG. 1, the first or upper glass plate **11** is removed so that the chips **10** are supported solely on the lower or bottom plate as shown in FIGS. 2 and 2*a*.

A suitable permanent backing for the mosaic chips **10** is provided. Preferably, the backing is a cement asbestos board and such will be used for illustration. However, other suitable materials such as sheet materials including metals like sheet aluminum, whether flexible or relatively more rigid like the cement asbestos board and including materials such as wood fiberboard, plywood, precast concrete slab and the like, could also be used as will be obvious to those skilled in the art.

Cement asbestos board **13** has first flat surface **13***a* and second flat surface **13***b* and a suitable adhesive layer **14** on the first flat surface **13***a* thereof. Any suitable adhesive is used for this purpose. Preferably, the adhesive is made from a polyester resin and may include an inorganic filler and a pigment. A number of other suitable adhesives or binding materials can be compounded from various resins such as polyester and epoxy resins and they can be filled, pigmented and/or reinforced with fibers as conditions may require. In like manner, the adhesive material may be a modified Portland cement bond coat which can be used on certain types of backing materials particularly where fire-resistant qualities in the finished mosaic panel are desired.

In order to directly position the permanent backing on the ceramic chips **10** without disturbing any portion of the mosaic configuration, cement asbestos board **13** is uniformly supported over substantially entirely its second flat surface **13***b*. The uniform support here illustrated comprises a vacuum plate **15** linked to an alternate source of vacuum and pressure **16** by flexible conduit **17**. When source **16** is actuated for vacuum, it applies a negative pressure over second surface **13***b* of cement asbestos board **13** through a plurality of channels **18**. Channels **18** are defined by a plurality of dividers **34** in vacuum plate **15** and are distributed so that channels **18** uniformly cover a major portion of the surface **13***b* of cement asbestos board **13**. Channels **18** thereby define a plurality of orifices on the surface of vacuum plate **15** at the interface with second surface **13***b*, with each orifice having the function of a suction cup. Consequently, cement asbestos board **13** may be supported so that adhesive layer **14** on first surface **13***a* of cement board **13** may be caused to lie substantially in one common plane. If adhesive layer **14** is placed in one common plane and then moved into parallel bonding contact with mosaic chips **10**, mosaic chips **10** will all be simultaneously adhered to cement asbestos board **13** and will keep their mosaic configuration.

This may be accomplished by any suitable method such as one of the two alternative methods illustrated in FIGS. 2 and 2*a*. In FIG. 2 vacuum plate **15** is supported over chips **10**. Vacuum plate **15** is mounted parallel to and over supporting surface **20** by suitable attachment to beam **35**. Beam **35** is in turn supported at opposite ends on cylinders **21** and **22** within which hydraulic pistons **23, 24** reciprocate respectively. (Beam **35** may of course be actuated other ways such as electrically or pneumatically instead of hydraulically.) Pistons **23, 24** are fixed to beam **35** by connecting rods **25** and **26** respectively. Pistons **23** and **24** are suitably actuated within cylinders **21** and **22** hydraulically for simultaneous and coordinated up and down motion in conventional fashion from a source of hydraulic fluid under pressure (not shown).

When pistons **23** and **24** are urged downwardly, cement asbestos board **13** (which has been uniformly supported over chips **10** by vacuum plate **15** as described above) is moved downwardly normal to chips **10** and into parallel contact therewith. (Alternatively, surface **20** could be moved upwardly.) After bonding contact has been made between cement asbestos board **13** and chips **10**, the negative pressure applied to board **13** by plate **15** for uniform support may be released and vacuum plate **15** moved upwardly out of contact with board **13** by reversing the hydraulic pressure in cylinders **21** and **22** and moving pistons **23** and **24** upwardly. Chips **10** have therefore been adhered to board **13** by adhesive layer **14** and may be further treated as described hereinafter.

In a preferred procedure, before vacuum plate **15** is moved upwardly the negative pressure applied by plate **15** is released and positive pressure is supplied from alternate vacuum and pressure source **16** to plate **15**. The positive pressure applied from plate **15** to board **13** serves to cause a positive bond between chips **10** and adhesive layer **14**. This eliminates all chance of failure of some of the chips **10** to adhere to board **13** when brought into contact with adhesive layer **14**. Positive pressure can also be applied from the hydraulic apparatus described.

In the alternate embodiment shown in FIG. 2*a*, board **13** is placed in parallel bonding contact with chips **10** by swinging board **13** about fixed point **27**. Chips **10** on plate **12** are placed on a suitable supporting surface **28**. Board **13** with its adhesive layer **14** are supported by vacuum plate **15** as above. Vacuum plate **15** is again linked to alternate vacuum and pressure source **16** by conduit **17**. In this case, however, vacuum plate **15** is bolted to pivot arm **29** by bolts **19**. Pivot arm **29** is pivotable about shaft **30** running through fixed point **27**.

Shaft **30** and pivot arm **29** are in turn supported by first upright arm **31**. First upright arm **31** is slidably and releasably locked to second upright arm **32** by bolt **33** fixed to arm **32** and passing through vertical slot **31***a* in upright arm **31** and threaded to nut **33***a*. Consequently, if nut **33***a* is loosened, first upright arm **31** may be moved up or down vertically to thereby select a suitable height for vacuum plate **15** and cement asbestos board **13** and fixed by tightening nut **33***a*. The vertical height selected will depend upon the thickness of plate **12** and the resulting height of mosaic chips **10**. When pivot arm **29** is pivoted about shaft **30**, board **13** will be swung parallel to chips **10** and into parallel bonding contact therewith.

After moving board **13** into parallel bonding contact with chips **10** through adhesive layer **14**, the various members will be positioned as seen in FIG. 3. Suitably, the unit may then be rotated 180° so that plate **12** is now on top and vacuum plate **15** is now on bottom as illustrated in FIG. 4. By removing plate **12** as illustrated in FIG. 5,

chips 10 are exposed. Suitably, chips 10 may then be adhesively further united to board 13 through adhesive layer 14 by any suitable steps such as heat curing the adhesive 14 or the like.

Further treatment of chips 10 (which define a mosaic pattern) may be desired in accordance with conventional practice. For example, cementitious grouting may be placed between the chips 10 and the edges of the board 13 may be cut, sanded, and the like.

FIGS. 6–9 illustrate the method and apparatus of the present invention which may be used for obtaining a mosaic pattern of chips in a single layer. The figures also illustrate how this apparatus may be integrated for cooperation with the pivoted vacuum plate of FIG. 2*a*.

With reference to FIGS. 6 and 7, individual chips are fed into a hopper 36 from which they are discharged through a gate 37 (when open) and into a trough or feeder 38. The chips are caused to be discharged from trough 38 when trough 38 is vibrated by arm 39 attached to trough 38. Arm 39 is actuated by a suitable power source 40.

The chips, upon being discharged from trough 38, are disposed upon a continuous conveyor belt 41. Belt 41 passes over plate 42. Plate 42 is supported upon a plurality of suction cups 43 which are in turn mounted upon beams 44. Belt 41 passes over suitably coated rollers 45, 46 which are in turn supported in bearings 47, 48 respectively. Bearings 47, 48 are mounted on base 49. Beams 44 are likewise mounted on base 49. Belt 41 also passes around a centrally disposed roller supported in bearing 51. Roller 50 is adjustable in bearing 51 to provide the desired uniform tension on belt 41.

Roller 46 is driven by motor 52 through a variable speed drive 53 and a belt or chain 54. Rotation of roller 46 in turn causes movement of belt 41 around rollers 46, 45 and 50 while belt 41 is passed over plate 42 in the direction of the arrows.

The chips leave trough 38 because of its vibratory movement imparted to the chips and drop onto belt 41 in the area generally indicated by 55. Since belt 41 is moved in the direction of the arrows, the chips entering upon belt 41 in the area 55 are carried through a mechanism A for disposing the chips in a single layer on the belt 41. This step is necessary since the chips in many cases fall from trough 38 onto belt 41 in overlapped and stacked relation. The mechanism A for disposing the chips in a common plane includes a plurality of transverse arms 56 supported over belt 41 on housings 58, 58′ on opposite sides of base 49. Each arm 56 is attached at one end to a spring 57 suitably mounted in housing 58. At the other end arm 56 is attached to a cam shaft 59 in housing 58′. Cam shaft 59 is in turn actuated by a motor 60 with suitable linkages 61. As motor 60 drives cam shaft 59, arms 56 are shifted transversely toward springs 57 out of phase with each other depending upon the shape of cam shaft 59. When each arm 56 reaches its furthermost lateral shift toward a spring 57, the spring 57 in combination with the further rotation of cam shaft 59 causes the arm 56 to return to its starting position back toward cam shaft 59 for a repetition of the cycle.

Depending from each arm 56 is a plurality of closely spaced flexible brushes 62. The lower edge 63 of brushes 62 is set above belt 41 at a distance approximately equal to the thickness of a single layer of chips. As a result, as the chips pass beneath brushes 62 on belt 41, the transverse motion of the brushes 62 on the chips 10 cause the chips to become disposed on belt 41 in a single layer.

The single layer of chips are then conveyed by belt 41 into a space 64 defined by a tunnel 65 having one closed end 66 and comprising an overhead plate 67 having two longitudinally depending lips 68, 68′ and a depending lip 69 forming closed end 66. Lips 68, 68′ and 69 are of a selected height, and plate 67 is positioned a distance above belt 41 so that the space 64 inside tunnel 65 has a vertical height approximately equal to the height of a single layer of chips conveyed into tunnel 65 by belt 41.

Plate 67 is suspended by a plurality of suction cups 70 which are in turn depended from a pair of transverse arms 71 and a pair of longitudinal arms 72 interconnected to form a frame denoted generally by 73. Frame 73 is pivotally supported for swingable movement about rail 74 positioned longitudinally alongside base 49. Base 49 is slidably supported on tracks 75, 76 (which are parallel to rail 74) so that base 49 may be longitudinally shifted from the positions shown in FIGS. 6 and 7 to a second position longitudinally spaced therefrom for cooperation with the apparatus illustrated in FIGS. 8 and 9 (to be described hereinafter).

When in position shown in FIGS. 6 and 7, tunnel 65 is supported by frame 73. Frame 73 is supported on one of its sides on rail 74 by bearings 77. Frame 73 is supported on its transversely opposite side from rail 74 by a pair of adjustment screws 78 which depend downwardly through arms 71, through base 49, and rest upon rail 76. Tunnel 65 may be raised or lowered with respect to belt 41 by turning screws 78 in the proper direction.

As the chips enter tunnel 65 their movement in the direction of the arrows is stopped when they reach closed end 66 of tunnel 65. Subsequent chips moving into tunnel 65 are also stopped in tunnel 65 when they meet and touch the initially stopped chips. The impact of chip upon chip and against the interior of tunnel 65 causes the chips to shift into a closely spaced mosaic pattern resting on belt 41. During this sequence belt 41 continues to move through tunnel 65 along the bottom thereof and under closed end 66. When a sufficiently large mosaic pattern has formed in tunnel 65, vibrating trough 38 is shut off and conveyor belt 41 is stopped by turning motor 52 off with suitable switches (not shown). Tunnel 65 and frame 73 are then pivoted upwardly and away from conveyor belt 41 about rail 74 leaving a mosaic pattern disposed on the portion of belt 41 that happened to have been positioned in tunnel 65 at the time that motor 52 was stopped. Base 49 is then slid longitudinally to the left as viewed in FIGS. 6 and 7 on tracks 75, 76.

Referring now to FIGS. 8 and 9, base 49 is shifted on tracks 75, 76 to the left until base 49 reaches collar 79 on track 76 whereupon further longitudinal shifting to the left is prevented. Belt 41 with the mosaic pattern disposed thereon is now adjacent to a transfer surface shown generally at 80. In the preferred embodiment transfer surface 80 comprises a pair of parallel frame members 81 which are pivotally and slidably supported on a rod 82 by bearings 83. Rod 82 is parallel to and adjacent tracks 75, 76. (Rod 82 may be a separate entity or an extension to the left of rail 74.) A resiliently deformable generally flat sheet 84 is supported between frame members 81. Any soft flexible resiliently deformable material may be used for sheet 84. A spongy material such as neoprene has been found suitable for this purpose.

When base 49 has been moved and stopped by collar 79, frame members 81 will be in position for cooperation therewith when frame members 81 are shifted to the right on rod 82 as viewed in FIG. 8 until positioned against collar 85. Frame members 81 are then pivoted about rod 82 until side 86 of sheet 84 rests upon and in contact with the chips which may be disposed upon belt 41. With side 86 of resilient sheet 84 pressing against the mosaic pattern, the entire apparatus resting upon an including base 49 is pivoted in conjunction with frame members 81 back about rod 82 until the chips have been turned 180° and are then resting on surface 86 of sheet 84. Because sheet 84 is a resiliently deformable member, the individual chips are suitably pressed into sheet 84 and are retained in their relative positions during the pivotal movement. Consequently, the mosaic pattern is not disturbed during this pivoting movement. Suitable clamps (not shown) may be employed to lock arms 81 and sheet 84 to belt

41 and base 49 during the pivotal movement. After the chips have been positioned onto surface 86, base 49 with the conveyor apparatus thereon is repositioned on tracks 75, 76 and shifted longitudinally to the right back to its position shown in FIGS. 6 and 7. It is then ready to begin a subsequent cycle for the formation of a mosaic pattern from chips supplied from trough 38.

The mosaic pattern that is now on surface 86 of sheet 84 is ready for joinder directly to a permanent backing member by a sequence of steps similar to that already described in FIG. 2*a*. Frame members 81 with sheet 84 and the mosaic chips resting on surface 86 may be slid in a horizontal position with the frame members 81 supported on rod 82 on one side, and on the other side resting upon a rod 87 that is parallel to rod 82 and transversely spaced therefrom. Movement is continued a suitable distance until frame members 81 are adjacent to vacuum plate 88 and left bearing 83 is adjacent to vacuum plate bearing 89. Vacuum plate 88 is suitably pivotally mounted on rod 82 on bearings 89, 90 and maintained in a fixed desired position by bearings 91, 92. When frame members 81 are in proper position, vacuum plate 88 is pivoted about rod 82. If a suitable permanent backing 93 is uniformly supported by vacuum plate 88 in the manner described with reference to FIG. 2*a* and has a suitable adhesive 94 on the surface of backing 93, vacuum plate 88 may be swung so that adhesive surface 94 may be brought into parallel bonding contact with the chips that are disposed on the surface 86 of sheet 84. FIG. 9 illustrates the relationship of the parts in these last named steps. In this figure, vacuum plate 88 and sheet 84 are shown in a position 60° from the horizontal. The remaining steps to complete the formation of a mosaic panel may then be executed as noted hereinbefore.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention as limited only by the scope of the appended claims.

What is claimed is:

1. A method of positioning a plurality of mosaic chips in a common plane to define a mosaic pattern comprising providing a controlled flow of chips onto a moving web in a single layer, providing a tunnel having one closed end and a height approximately equal to the thickness of said layer of chips, moving said web with said chips resting thereon through said tunnel along its bottom and under the closed end thereof so that the chips on said web are stopped by the closed end of the tunnel and retained therein, said closed tunnel end and chips initially stopped also serving to stop subsequent chips moved by said web while the impact of chip upon chip and tunnel serve to shift the chips into a closely spaced mosaic pattern on said web, transferring said closely spaced mosaic pattern of chips from said web to a generally flat resiliently deformable horizontal surface by holding said web stationary, swinging said tunnel about a fixed point away from said web, swinging said resilient flat surface about a fixed point into overhead parallel contact with the mosaic pattern on said web, turning said resilient flat surface 180° in cooperation with the web without disturbing the mosaic pattern so that the chips face upwardly on said resilient surface, providing a permanent normally flexible backing member having first and second flat surfaces and adhesive on the first flat surface thereof, supporting said backing member substantially uniformly over its second flat surface with a vacuum plate so that said entire first flat adhesive surface lies substantially in a single plane, moving said first flat adhesive surface by swinging said backing member about a fixed point, while continuing to uniformly support the backing member, parallel to said upwardly spaced chips and into parallel bonding contact therewith.

2. Apparatus for the manufacture of mosaics comprising: a horizontal conveyor, means for controllably supplying chips to said conveyor, means for arranging said chips on said conveyor in a single layer, a tunnel having one closed end and a height approximately equal to said single layer of said chips, said conveyor being disposed as as to pass through said tunnel along its bottom and then under the closed end thereof, the closed end of said tunnel being operable to stop said layer of chips within the tunnel as the conveyor passes under the closed end, said layer of chips being repositioned on the conveyor inside the tunnel into a closely spaced mosaic pattern by the impact of chip upon chip and tunnel as the chips are stopped within said tunnel, means for rotating said mosaic pattern 180° and transferring the same from within said tunnel to the top of a generally horizontal flat surface without disturbing said pattern, and means for directly bonding a permanent backing member to said mosaic pattern on said flat surface without disturbing said pattern.

3. Apparatus for the manufacture of mosaics comprising: a continuous horizontal belt conveyor, means for driving said belt conveyor, a hopper and vibrating trough feeder adapted for controllably supplying chips onto said belt, a plurality of transverse arms supported over said belt adjacent said trough, means to transversely reciprocate said arms, a plurality of closely spaced flexible brushes depending from each of said arms over said belt at a distance operable to arrange the chips passing thereunder on the belt in a single layer, a pair of supporting tracks parallel to the longitudinal axis of said belt conveyor for slidably supporting said conveyor for movement to a first position for cooperation with said trough and to a second position spaced therefrom, a plate pivotally supported on a rail adjacent said tracks for periodic positioning over said belt conveyor, said plate having depending lips on its sides and on one of its ends opposite from said trough to define a tunnel over said belt of an internal height approximately equal to the thickness of a single layer of chips, said belt defining the bottom of the tunnel, a rail parallel and adjacent to said belt conveyor when in its second position, a flat resiliently deformable surface pivotally supported on said rail adjacent said second position for overhead contact with said belt and chips thereon, said conveyor being swingable in cooperation with the pivoting of said resiliently deformable surface when the conveyor is in said second position and the deformable surface is in overhead contact therewith to transfer chips in a mosaic pattern from said belt to said deformable surface and to thereby rotate the chips 180° from their starting position on the belt, and a pivotally supported vacuum plate for uniformly supporting a permanent mosaic backing member, said vacuum plate and resiliently deformable surface being slidable relative to each other so that said surface may be placed alongside said vacuum plate and a permanent backing member may be pivoted into parallel bonding contact with chips on said resilient surface.

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