June 30, 1964 D. C. CARTER 3,138,898

JOINT FOR INSULATING BOARD ROOF PLANK

Filed Aug. 14, 1957

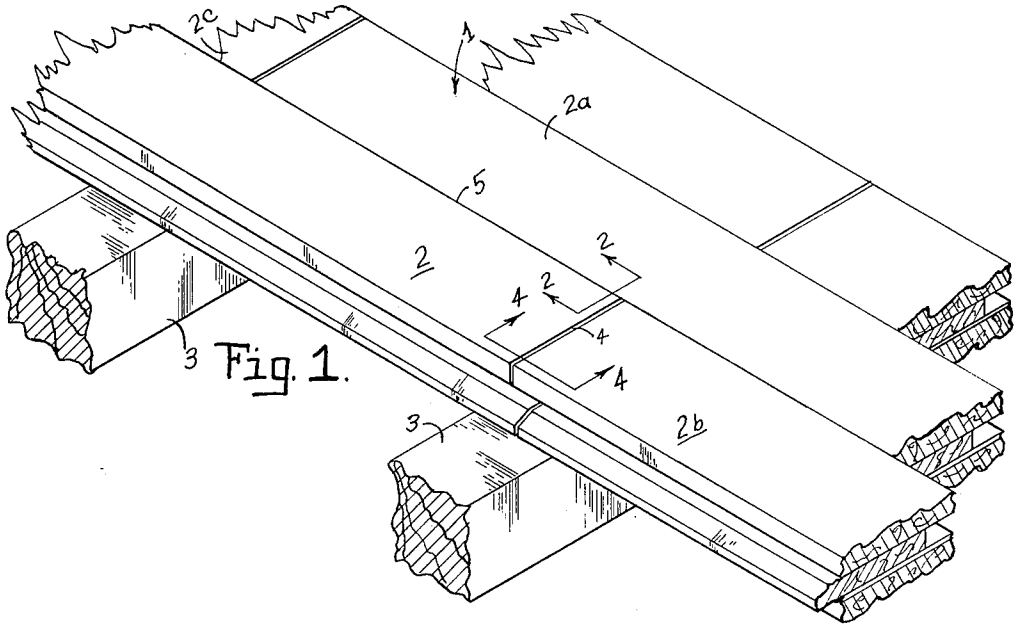


Fig. 1.

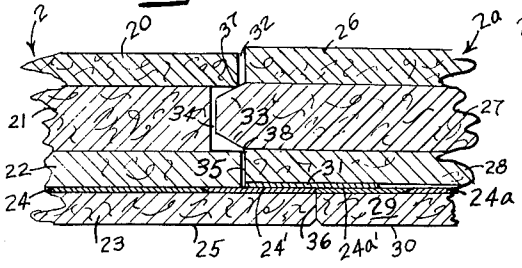


Fig. 3.

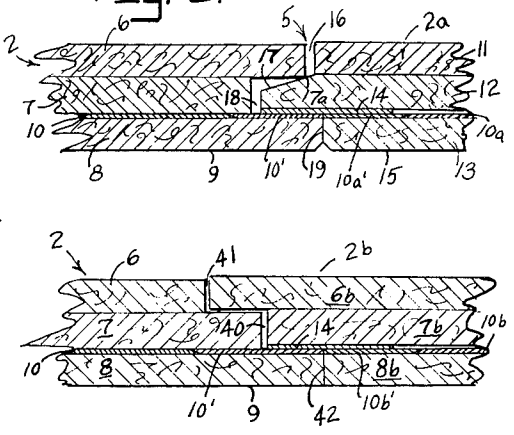


Fig. 2.

Fig. 4.

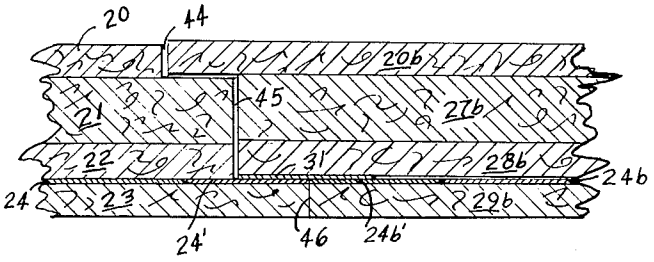


Fig. 5.

INVENTOR:
DAVID C. CARTER
BY
John A. McKinney
ATTORNEY

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JOINT FOR INSULATING BOARD ROOF PLANK

David C. Carter, Martinsville, N.J., assignor to Johns-Manville Corporation, New York, N.Y., a corporation of New York

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4 Claims. (Cl. 50—347)

This invention relates to insulating roof deck planks or slabs with particular reference to the means of joining and providing a vapor barrier for such slabs.

In the construction of small structures, such as homes, garages, small office buildings, etc., it is common to provide a roof structure with the finished ceiling, vapor barrier, and insulation manufactured into an integral unit. It is a usual practice to finish the roof by covering the roof deck with a layer of asphalt followed by a layer of roofing paper and finished with a layer of asphalt and fine gravel or roofing shingles directly over the paper.

Any problems arising from such a ceiling and roof structure usually come from the junctures between the slabs. Thus, the joints must be of such a construction as to prevent the asphalt, during initial installation or during periods of hot sunny weather, from permeating through the joints. At the same time, means must be provided in the joints to continue the vapor barrier present in the body of each slab and thereby to block off any moisture tending to seep through the ceiling and roof from within the dwelling to portions of the slab on the cold side of the vapor barrier, wherein condensation may occur within the fibrous slab to an objectionable degree. The joint must also be of such a construction as to present no particular problems in manufacturing. Thus, if the joint must be machined to allow for a proper mating of planks, the cost of manufacturing the roof deck slabs mounts unnecessarily. Finally, the planks and joints therein must be conducive to ready assembly without necessitating caulking of the joints throughout the roof and without marring or scoring the finished ceiling surface.

An object of this invention therefore is a joint structure for roof deck slabs which prevents seepage of hot fluids, such as asphalt, from the exterior of the structure to within the interior.

A further object of this invention is a joint structure for roof deck slabs with continuous vapor barrier means provided therein, which forms a positive vapor seal for any moisture tending to escape from within the building through the joints to the asphalt-sealed upper portions of the slabs.

A still further object of this invention is an integral roof deck slab which is relatively simple to manufacture, i.e., that follows conventional fabricating processes without including any machine finishing operations at the ends.

Another object of this invention is a roof deck slab which is readily and simply assembled with similar units to form the combined ceiling and insulating roof deck; and, furthermore, which joint structure is such as to allow this ease and speed of assembly without any visible marring of the pre-painted slab surface.

These and other objects will be readily apparent to those skilled in the art from an examination of the following description and appended claims and drawings wherein:

FIG. 1 is a perspective view of the ceiling joists of a building with the roof deck slabs assembled thereon;

FIG. 2 is an enlarged cross-sectional view along section lines 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view, similar to FIG. 2, of a modified form of long joint;

FIG. 4 is a cross-sectional view along lines 4—4 of FIG. 2 depicting the short joint used with the long joint of FIG. 2; and

FIG. 5 is a cross-sectional view, similar to FIG. 4, depicting the short joint used with the long joint of FIG. 3.

Referring to FIG. 1, the complete roof structure 1 comprises ceiling joists 3 arranged in a parallel series and secured to conventional bearing means (not shown). Secured to the joists are a plurality of roof deck slabs 2, 2*a*, 2*b*, etc. laid in parallel courses transverse to the joists. In the laying of each course, the slabs are positioned, and are so dimensioned, that the short ends of each slab overlie the approximate center of a joist. Thus, when the slabs 2, 2*b* are forced together, the joint 4 overlies the joist 3.

The next course of slabs 2*a*, 2*c* is secured to the joists and to the abutting course 2, 2*b* by forcing them against each other and to the adjacent course to form the long joint 5, and securing the slabs to the ceiling joists. Special fasteners are provided for securing the slabs to the joists and additional securing means may be used along the joint 5, if so desired.

The long joint 5 and the short joint 4 are different in construction as the requirements of the two are somewhat different. Thus, the short joint must be of such a construction as to allow easy assembly without any transverse sliding of the slab. This requirement is necessary for the short joint to prevent any visible marrings of the underside painted surface by the ceiling joists. On the other hand, the long joint must be stronger than the short joint as it is unsupported for most of its length while the short joint is always supported by a joist.

Referring to FIG. 2, the particular long joint 5 and the slab construction used is shown in an enlarged cross-sectional view. The particular slabs illustrated are comprised of a plurality of layers of insulating wood fibre planks cemented together to form a unitary slab. Slab 2 comprises three layers of wood fibre planks 6, 7, 8 of different construction to provide together the necessary qualities for the entire slab. Plank 8 may be ordinary building board of fine interwoven fibres; plank 7 may be of a fibre board having greater insulating qualities and of a coarser fibre construction to increase the structural strength of the slab; plank 6 may be of the same type as plank 7 except for added asphalt impregnation to increase the weather resistant qualities of the slab. The significance of the particular construction of the slab as regards the materials used is of a secondary nature as the various planks are well known in the building field. Thus, it is well known, for example, to substitute a unitary construction for the cemented layers or to make planks 6, 7 of one piece construction with the building board 8 cemented thereto. However, applicant has discovered that the veneer construction is well suited for the particular joints used as the various planks need undergo only an edge-sawing operation prior to final assembly. In view of the fibrous nature of the materials used, a great cost saving ensues in manufacturing the slabs utilizing only this sawing operation, in lieu of any machining methods.

Since plank 8 is the one visible from the interior, its lower surface is finished with a coat of paint 9 and the corner edges are trimmed to form a bevel. Cemented to the opposite surface of the plank 8 is a layer of specially prepared paper 10 to form a vapor barrier for the slab. The paper 10 is brought short of the edge on all sides to prevent curling of the edges. While paper is used, it is understood that numerous other well known forms of vapor barriers may be substituted therefor, the various types of vapor barriers being well known in the art.

The particular joint construction is a modified form of a combined ship-lap and tongue-in-groove joint. In slab 2, the planks are cemented to provide, at one of the long edges, an extended lip on plank 8, a stepped or recessed center portion for plank 7, and a lip on plank 6 extending

to a distance laterally intermediate the aforementioned lip and recessed center portion. Correspondingly, the center plank **12** of slab **2***a* has along its adjacent long edge a laterally extending lip portion, while plank **13** is set back, and upper plank **11** is cemented to plank **12** so that its edge is approximately in line with the edge of the lowermost plank. Additionally, plank **12** has cemented thereto on its lower surface a layer of vapor barrier paper tape **14**, which paper is similar to paper **10**, **10***a*, and tapes **10'** and **10***a'* are added to planks **8** and **13** to seal the edges of the vapor barriers provided and to extend the barriers to their respective plank edges. It will be noted that the thickness of the tape **14** elevates the overlying ends of planks **12** and **11** with respect to the adjacent ends of planks **7** and **6**, thus permitting engagement of the lower corner of plank **6** with the beveled surface **17** of the upper surface of plank **12**. Because the plank **12** is rather long with respect to the width of the tape **14**, the lower surface of plank **12**, except perhaps for a small portion adjacent the tape **14**, is in contact with the vapor barrier paper **10***a*. The plank **12** is thus angled very slightly with respect to the plank **13** and, because it is somewhat resilient, can be readily conformed to the upper surface of the plank **13**.

In assembling the slabs **2**, **2***a*, the resultant joint **5** has the planks **8**, **13** forming a tight butt sub-joint **19**. The beveled surface **17** mates with the lower corner of the intermediate lip on plank **6** to form a tight modified-line joint **17***a*. Even though planks **6**, **7**, **11**, **12** are of the same thickness, this line joint is possible because (*a*) of the relatively coarse nature of the fibrous planks, (*b*) spacings **16**, **18** are provided between adjacent planks **6**, **11** and **7**, **12**, and (*c*) there is a certain amount of "give" or flexibility in the lip construction and the planks themselves. When planks **8**, **13** are tightly butted and because of the flexibility, spaces, fiber coarseness, and added thickness of the tape **14**, raising slightly the ends of planks **12** and **11** with respect to planks **7** and **6**, a very slight cocking action occurs of one slab against the next to form the tight second seal **17***a*. In addition, paper layers **10'**, **10***a'* tightly mate with paper **14** to form a continuous vapor barrier seal.

In the modified construction of FIG. 3, the modified long joint is basically similar to that illustrated in FIG. 2. The modified construction is used in those installations where a greater thickness of slab is required, i.e., more insulation and increased weather resistance, as in the more northern or colder areas.

Planks **20**, **21**, **23** are similar in construction to planks **6**, **7**, **8** of FIG. 2 with the exception that plank **21** is of greater thickness than corresponding plank **7**. In addition, a second intermediate layer **22** of insulating material is cemented between planks **21** and **23**. Its lip extension is of the same length as the lip on upper plank **20**, plank **21** cooperating with plank **22** to provide a stepped or recessed center portion in the center section of the joint, generally similarly as in the FIG. 2 construction. Correspondingly, slab **2***a* has planks **26**, **27**, **29** similar to planks **11**, **12**, **13** of FIG. 2 but with the center plank **27** of greater thickness to mate with the thickness of plank **21** on slab **2**. Likewise, an additional plank **28** is inserted between planks **27**, **29** to correspond with added plank **22** in the adjacent slab.

In this modification, a double modified-line joint may result by the aforementioned flexibility and cocking action and due to the slight coarseness of the fibrous material. The first modified-line joint occurs at **37** between beveled surface **33** and the corner of the lip of plank **20**, and corresponds to the joint **17***a* of FIG. 2. A second modified-line joint **38** may occur between beveled surface **33** and the upper corner of the lip on plank **22**, depending upon the coarseness of the fibers, the degree of flexibility of the board, and whether fasteners are used to secure adjacent courses of slabs together. Thus, an added seal may be provided.

Similarly to the joint **5** of FIG. 2, spacings **32**, **34**, **35** are provided to obtain the modified line joints through the cocking and flexibility action. Vapor barriers **24**, **24***a*, **24'**, **24***a'*, **31** provide moisture protection while surfaces **25**, **30** are painted areas to enhance the esthetic qualities of the slab similar to the corresponding structure of FIG. 2.

With either the long joint of FIG. 2 or FIG. 3, a modified ship-lap short joint **4** is used. Referring to FIG. 4, the joint construction shown is used in conjunction with the slabs and joint of FIG. 2. Planks **6**, **7**, **8** are laminated, as described, with corresponding members **6***b*, **7***b*, **8***b* in slab **2***b*. Vapor barriers **10'**, **10***b'* have lapped over them vapor barrier tape **14**. Planks **8**, **8***b* form a tight butt sub-joint **42** while members **7**, **7***b* and **6**, **6***b* are spaced from each other to provide air spaces **40**, **41** respectively. These spacings are required to provide ease of assembly and to prevent marring of the painted surfaces **9**, **15**. The joint provides complete asphalt penetration and vapor penetration protection similar to the long joint of FIG. 2.

When the slabs are assembled and fastened to the ceiling joist structure, slab **2***b*, for example, is positioned on the joists so that plank **8***b* abuts plank **8**; the short joint is then properly spaced transversely of the joists **3**. The slab **2***b* is tapped lightly against its long edge to move slab **2***b* parallel to the longitudinal axes of joists **3**. A long joint, as shown in FIG. 2, results between slabs **2***b* and **2***a*. In view of this sliding motion, it is evident that no visible mars occur on the painted surfaces **9**, **15** except for those which overlie the ceiling joists and which are not visible from the interior.

The short joint for the modified slab and joint construction of FIG. 3 is shown in FIG. 5 and resembles the short joint of FIG. 4, both in structure and in function. In this modified slab form, planks **21** and **22** are cut similar to plank **7**; planks **27***b* and **28***b* are cut similar to plank **7***b*. Planks **20** and **20***b* are similar to planks **6**, **6***b*; planks **23**, **29***b* are similar to planks **8**, **8***b*; vapor barriers **24**, **24***b*, **24'**, **24***b'*, **31** provide a vapor seal identical with papers **10**, **10***b*, **10'**, **10***b'*, **14**; spaces **44**, **45** correspond to spaces **41**, **40** and butt joint **46** is identical with butt joint **42**. The short joint of FIG. 5 is also assembled in a manner identical with the short joint of FIG. 4.

With either the slab of FIGS. 2 and 4, or the modified slab of FIGS. 3 and 5, the finished roof is completed in the customary manner, for example, asphalt may be spread over the entire assembled roof surface and a covering of paper applied thereto. A layer of roofing shingles or layers of asphalt and fine gravel finish the exterior.

With this common type of roof finish, the particular joints of this invention show their merits. Referring to FIG. 2, the asphalt, having a relatively low viscosity due to the heat of the sun's rays or having been heated for initial application, cannot pass line joint **17***a*. If some asphalt were to pass this joint due to a misalignment or leak, a second barrier is the vapor barrier seal between papers **14** and **10'**. In addition, a third barrier presents itself for any seeping asphalt at the tight butt joint **19**.

In the modification of FIG. 3, an additional barrier for the asphalt may be presented at the added line joint **33**, as discussed previously.

With the joints of FIGS. 4 and 5, a first barrier is the sub-joint between planks **6***b* and **7** (FIG. 4) or planks **20***b* and **21** (FIG. 5); a second barrier is the sub-joint adjacent tape **14** (FIG. 4) or tape **31** (FIG. 5); the final barrier is butt sub-joint **42** (FIG. 4) or **46** (FIG. 5). As shown in FIG. 4, the planks **7***b* and **6***b* are slightly elevated at the joint due to the thickness of the tape **14** interposed between the plank **7***b* and the vapor barrier papers **10'**, **10***b'*. Of course, the thicknesses of the paper and the tape are greatly exaggerated in the drawing, and in practice, because of fiber coarseness and the relatively small distance the plank **6***b* is elevated, the lower surface of plank **6***b* may well be in contact with the upper surface of plank **7** even without being secured to the joist below.

When applied on a roof, however, the slabs are nailed or otherwise fastened to the underlying joists so that the slab **2***b* is forced toward the joist and into engagement with the upper surfaces of the planks forming the slab **2**. The joint shown in FIG. 5 functions in a similar manner.

With any of the joints, it is seen that structure is provided wherein asphalt or other liquid penetration is eliminated.

In addition to the asphalt or liquid penetrating protection afforded by the particular joint constructions, the joints also provide complete vapor barrier protection. Referring to FIG. 2, for example, tapes **10'**, **10***a'* abut each other tightly while tape **14** is compressively mated with such tapes over the sub-joint **19**. Any moisture tending to escape from the interior through the joint meets a first barrier in the sub-joint **19**; a second barrier presents itself at the upper terminal of the subjoint adjacent the barrier tape **14**. Additionally, tightly mated tapes **14**, **10'**, **10***a'* form a vapor barrier not only adjacent the sub-joint **19** but also, in conjunction with barriers **10**, **10***a*, for the moisture tending to escape through the body of planks **9** and **13**. Similar protection is provided with the joints illustrated in FIGS. 3–5.

The spacings between the planks, such as **40**, **41** (FIG. 4) and **16**, **18** (FIG. 2), play an important part in the construction and function of the joints. As previously recited, they allow the slight cocking action to occur to thereby obtain the modified line joint of FIGS. 2 and 3. In addition, they permit fast assembly of the various slabs as the spacings allow the lower planks to form tight subjoints at all times.

While the term, modified line joint, has been used herein to describe joints such as **37**, **38** (FIG. 3), it must be noted that a true line contact or line joint is not obtained as the corner of plank **20**, for example, when pressed firmly against bevel side **33**, is blunted due to the flexibility of the plank and the coarseness of the fibres. The term has been used however to differentiate from true planar surface contact.

It is obvious that numerous modifications and changes are possible, all of which are encompassed by the instant invention. Thus, the slab, instead of having the laminated construction illustrated and described, may be of unitary or solid construction entirely, or in part, as may be dictated by patricular manufacturing techniques. At the same time, the invention has been described with reference to various forms of wood fibre boards; it is also evident from the instant disclosure that various other types of cellulose insulating and weather proofing planks may be substituted for the wood fibre planks described herein, as for example, sugar cane fibre and other like or similar fibres. In addition, other compositions, such as hair or the like; inorganic fibres such as, rock wool, asbestos or the like; or various combinations thereof may be substituted for the wood fibres described herein. It will be understood that these and other changes and modifications may suggest themselves to one skilled in the art, all of which fall within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. A joint construction between a pair of roof deck slabs, comprising adjacent side edges of the slabs, the adjacent side edges being comprised of upper, lower, and central sections, the side edge of the central section of one slab extending beyond the side edges of the upper and lower sections thereof, the side edges of the upper and lower sections of the other slab extending beyond the side edge of the central section thereof, the side edges of the upper sections of the slabs being slightly spaced from each other and the side edges of the central sections of the slabs being slightly spaced from each other, the central section of said one slab having an upper beveled surface, the upper section of said other slab having a lower corner, the beveled surface being disposed beneath and in engagement with the lower corner of the upper section of said other slab, the side edges of the lower sections of the slabs being in tight abutting relationship, vapor barrier means between the lower and central sections of each slab and substantially covering the lower sections, and additional vapor barrier strips spanning and compressively contacting the vapor barrier means overlying the abutting lower sections.

2. A joint construction as recited in claim 1, wherein each slab is comprised of fiberboard.

3. A joint construction as recited in claim 2, wherein each section of each slab comprises a layer of fiberboard.

4. A joint construction as recited in claim 1, wherein the vapor barrier means and the vapor barrier strips comprise vapor barrier paper.

References Cited in the file of this patent

UNITED STATES PATENTS

213,740	Conner	Apr. 1, 1879
508,751	Pope	Nov. 14, 1893
845,107	Morrill	Feb. 26, 1907
1,846,658	Rockwell	Feb. 23, 1932
2,008,244	Crooks	July 16, 1935
2,013,218	O'Neil	Sept. 3, 1935
2,152,694	Hoover	Apr. 4, 1939
2,227,878	Crooks	Jan. 7, 1941
2,232,075	Nevin	Feb. 18, 1941
2,266,746	Elmendorf	Dec. 23, 1941
2,270,808	Kaye	Jan. 20, 1942
2,390,087	Fink	Dec. 4, 1945
2,537,154	Norrid	Jan. 9, 1951
2,872,882	Paul	Feb. 10, 1959
2,887,426	Knold	May 19, 1959

FOREIGN PATENTS

168,141	Austria	Apr. 25, 1951
244,532	Switzerland	Apr. 16, 1947
248,515	Great Britain	Mar. 11, 1926
456,183	France	June 12, 1913
541,733	Great Britain	Dec. 9, 1941

OTHER REFERENCES

American Builder, February 1954, pages 152–154.
Architectural Record, May 1954, pages 216, 217.