Aug. 1, 1939. L. KIRSCHBRAUN 2,168,218

MASTIC SHINGLE

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Fig. 1.

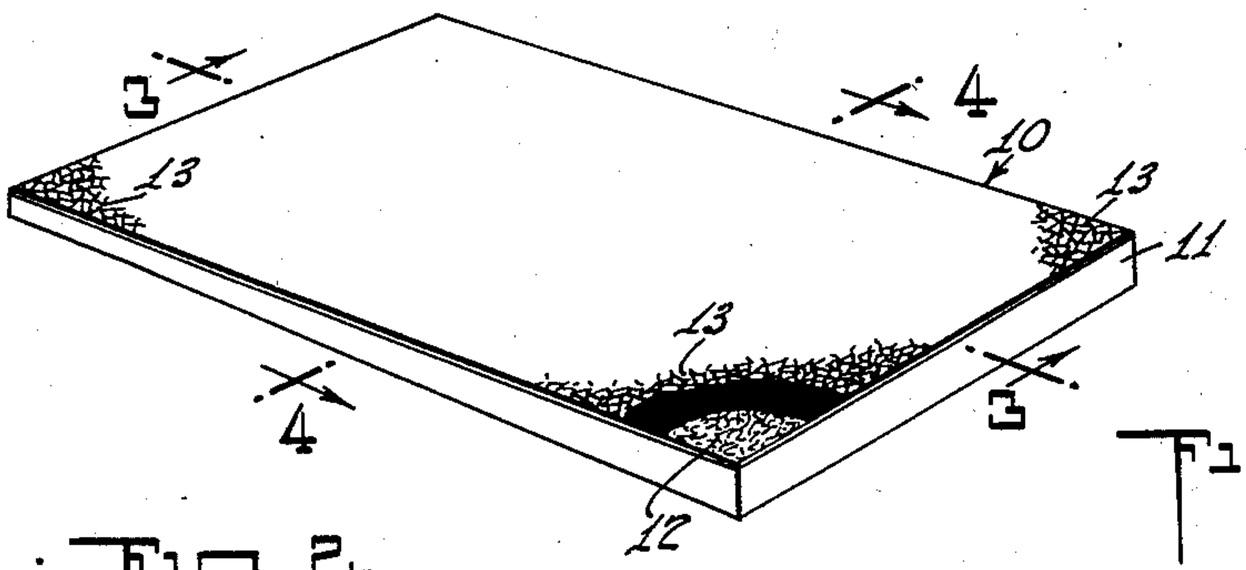


Fig. 2.

Fig. 3.

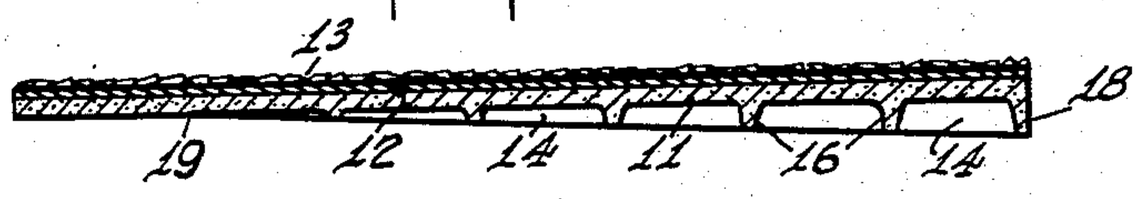
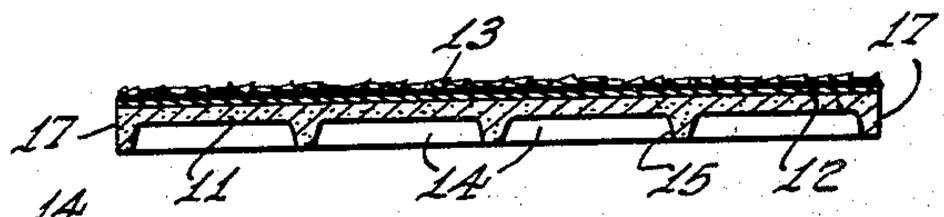


Fig. 4.



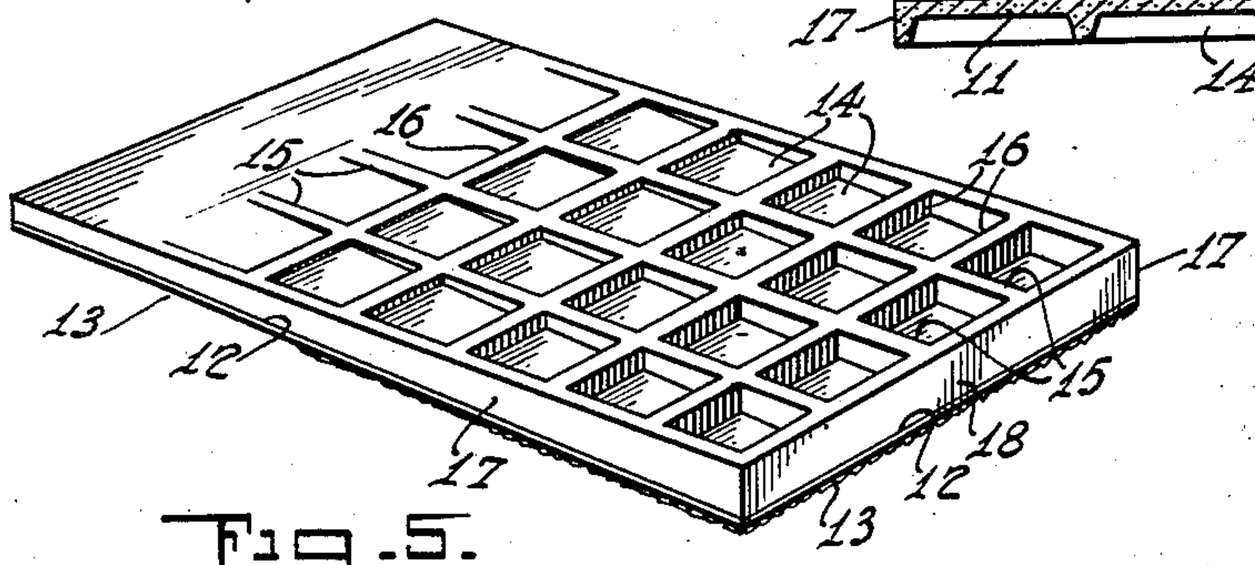


Fig. 5.

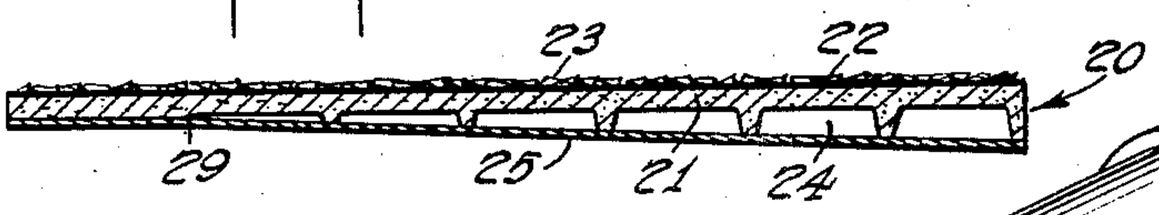
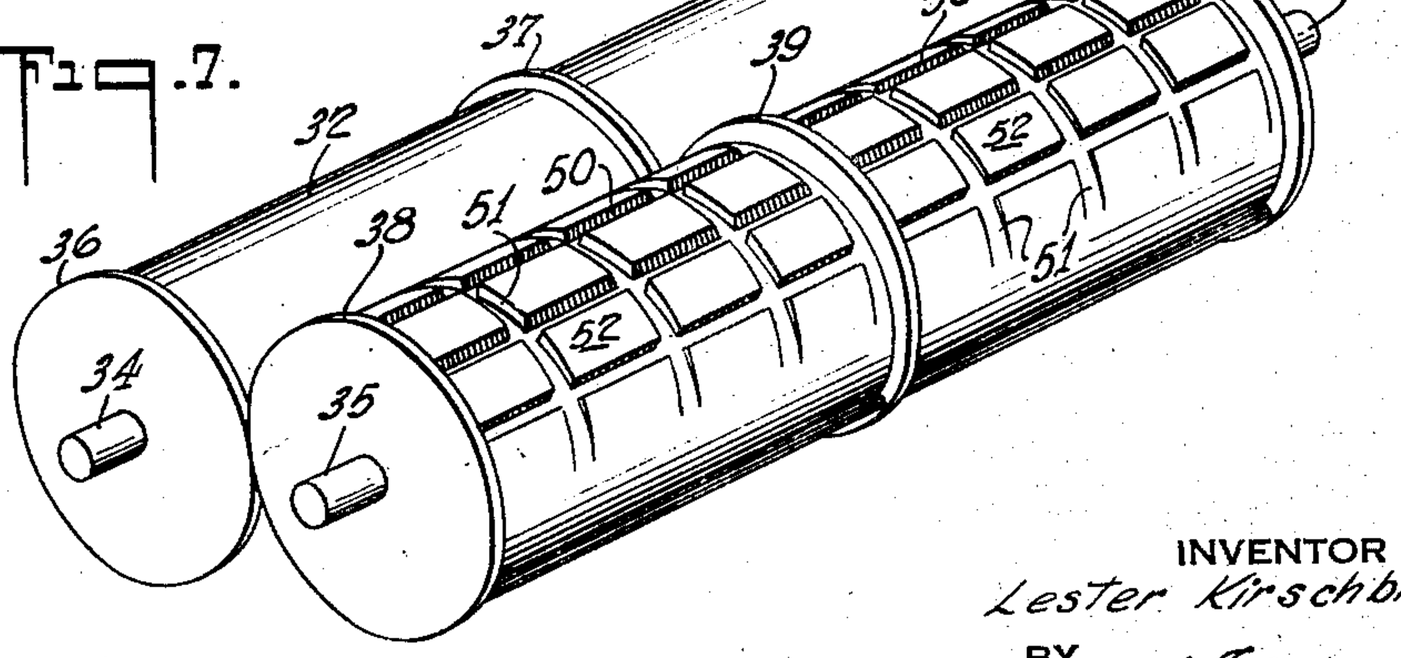


Fig. 7.



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MASTIC SHINGLE

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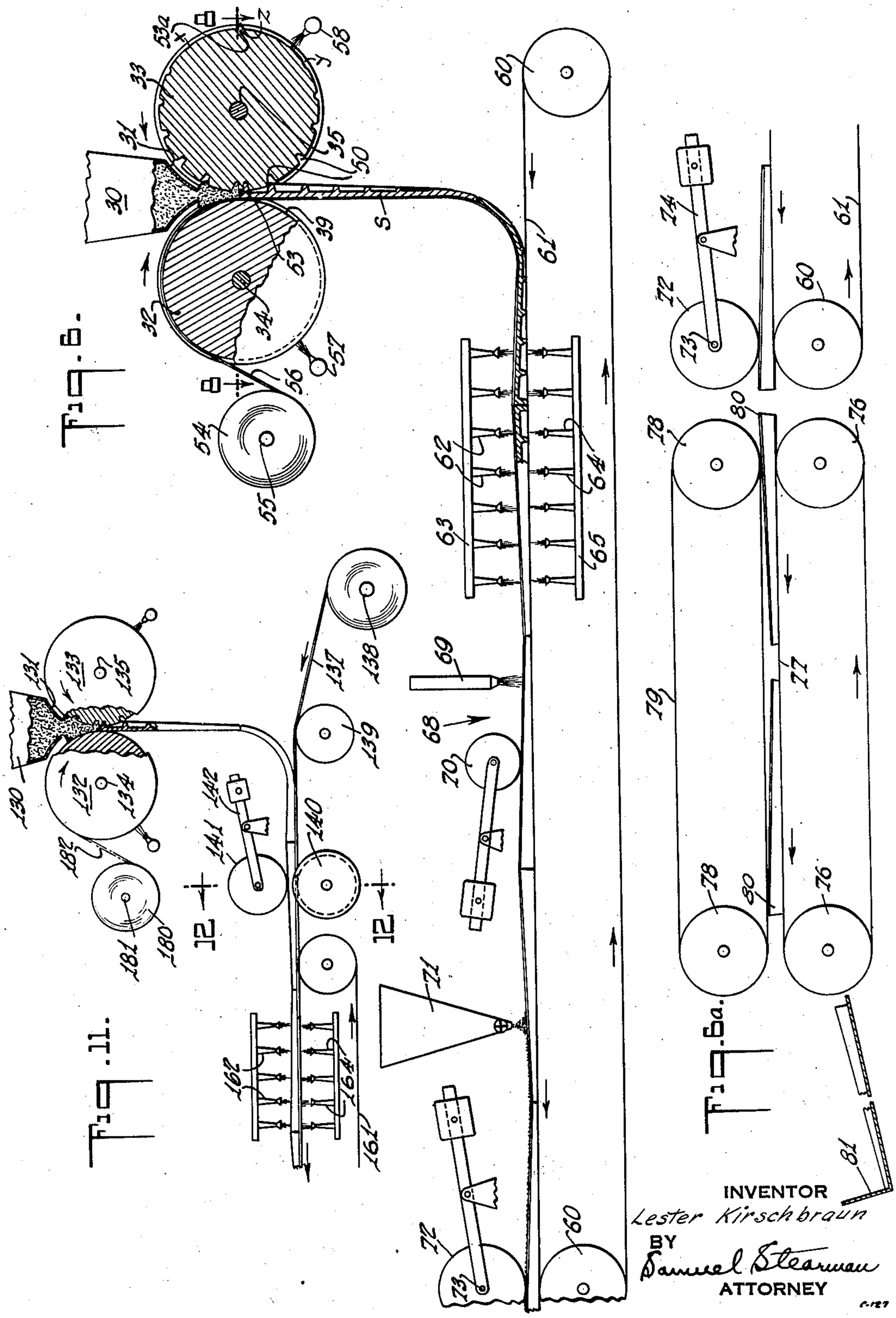

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MASTIC SHINGLE

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Fig. 10.

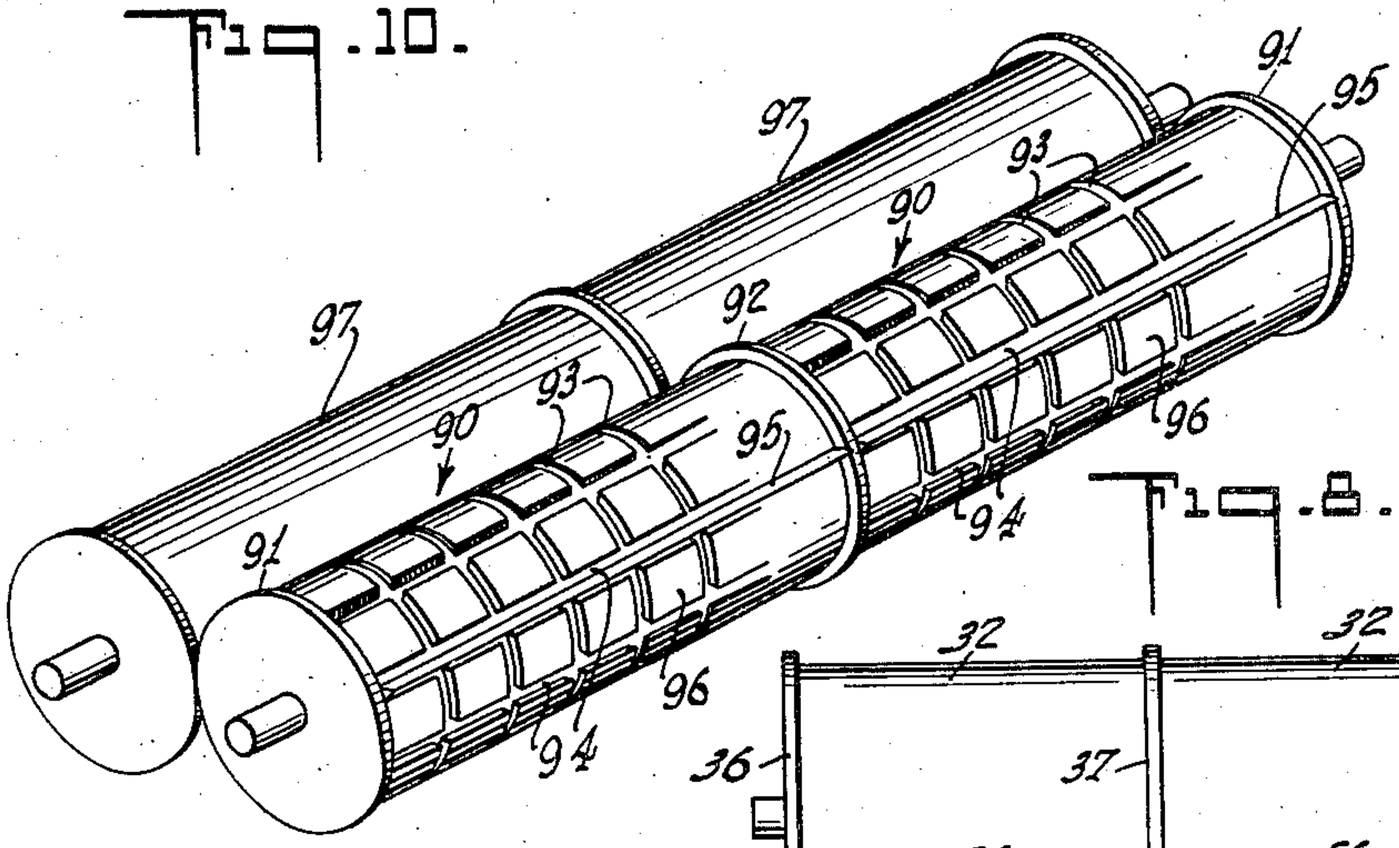


Fig. 8.

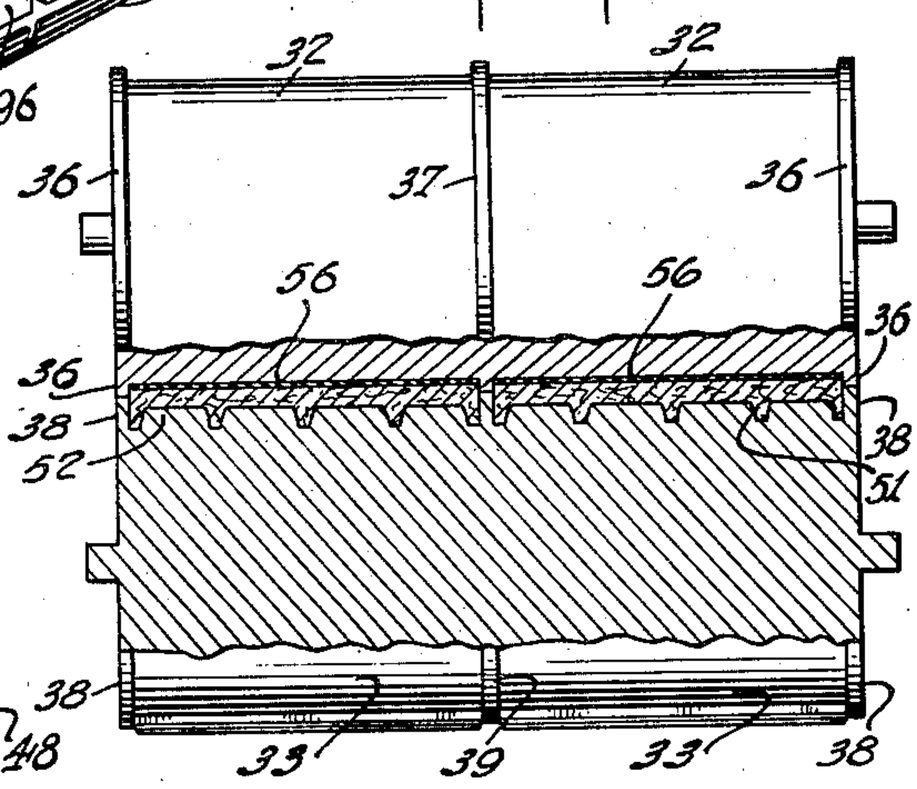
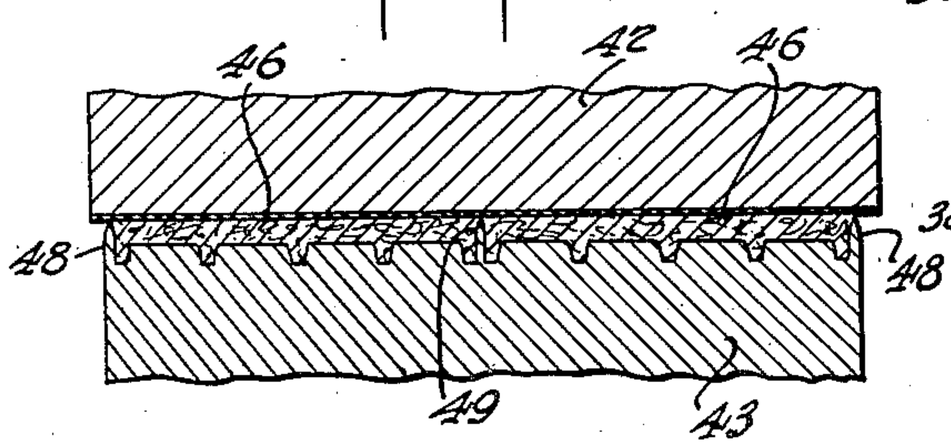


Fig. 9.



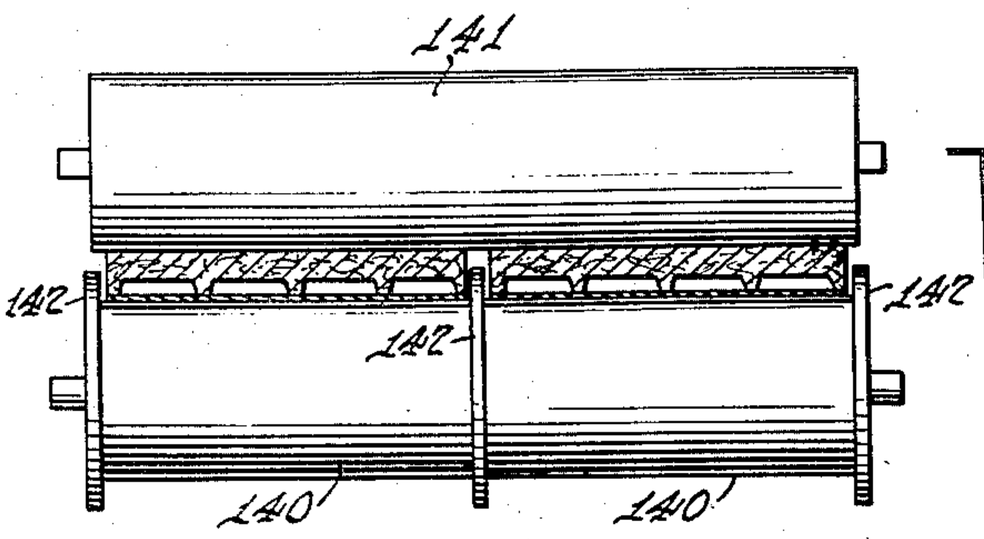


Fig. 12.

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UNITED STATES PATENT OFFICE

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MASTIC SHINGLE

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Application September 28, 1937, Serial No. 166,075

2 Claims. (Cl. 108—8)

This invention relates to mastic shingles of the type in which the major portion of the shingle is composed of a plastic composition that is capable of setting to a more or less hardened condition. Essentially this composition comprises a bituminous material, such as asphalt or like waterproofing substance, mixed with fiber of any suitable character and hardening fillers, such as finely divided solids as, for example, clay, talc, crushed slate, slate dust and the like, the whole being macerated or kneaded to form a homogeneous plastic mass that can be suitably shaped to the desired form under pressure.

Shingles have heretofore been prepared from compositions of the above described types, these compositions being particularly advantageous for such use inasmuch as they may be molded into tapering elements with thick butts similar in form to the conventional wooden shingles. Also, the hardened plastic composition provides a relatively rigid and substantial shingle having good weather-resistant characteristics and presenting a pleasing appearance on the roof. Due, however, to the materials of which the plastic compositions are composed, they are relatively heavy and costly and accordingly the shingles heretofore prepared therefrom have, for the most part, been heavier and more expensive than is desired or necessary to provide a well constructed roof covering.

The principal object of the present invention is to provide a mastic shingle employing a hardened plastic composition of the type described above as its major constituent, which requires the use of smaller quantities of the plastic material while retaining the appearance and strength of mastic shingles heretofore proposed. A further feature of the present invention is the provision of a shingle of the above type so constructed that dead air spaces are provided between overlying shingles or within the structure of the shingle itself to impart a substantial thermal insulating effect to the roof or side wall covering laid with the shingles.

A shingle constructed in accordance with my invention and by which the above stated objects are obtained comprises, briefly stated, a hardened plastic body portion having extending inwardly from the underface thereof a plurality of depressions separated by longitudinally and transversely extending ribs. In other words, the undersurface of the body portion of the shingle of the present invention is provided with a waffle-like configuration. The body of the shingle may be of uniform thickness but preferably tapers in thickness longitudinally thereof. In the latter case, the depressions preferably successively diminish in depth from those of a maximum depth adjacent the butt end to those of a minimum depth adjacent the upper end of the shingle. A sheet of a suitable water-resistant material such as asphalt saturated felt is preferably secured to one or both surfaces of the plastic body portion to reinforce the shingle and to give it sufficient strength to prevent distortion thereof and to resist sloughing and pulling away of the plastic body from the nails when the shingle is applied on a roof or side wall and subjected to solar heat. The upper surface of the shingle may be suitably protected against the weather, for example, by a coating of a weather-resistant material such as asphalt having partially embedded therein a surfacing of mineral grit.

A mastic shingle in accordance with the invention and having a waffle-like contoured undersurface is lighter in weight than the mastic shingles of the prior art of similar overall dimensions, due to the reduction in the amount of the hardened plastic material required. However, due to the reinforcement provided by the intersecting ribs, which define the waffle-like configuration of the undersurface of the plastic body, no loss in the strength or weather-resistant characteristics of the shingle results. The depressions formed in the shingle body portion moreover provide dead air spaces between overlapping shingles whereby a substantial thermal insulating effect is imparted to the roof or wall covering laid from the shingles.

The invention will be more fully understood and further advantages and objects thereof will become apparent when reference is made to the detailed description which is to follow and to the accompanying drawings in which—

Figure 1 is a perspective view of a shingle embodying the present invention;

Figure 2 is a perspective view of the shingle of Fig. 1 in inverted position;

Figure 3 is a sectional view taken on the line 3—3 of Fig. 1;

Figure 4 is a sectional view taken on the line 4—4 of Fig. 1;

Figure 5 is a sectional view similar to Fig. 3 but illustrating a modified form of shingle;

Figure 6 is a view partly in elevation and partly in section illustrating diagrammatically an apparatus which may be employed to produce certain forms of shingles embodying my invention;

Figure 6ª is a similar view depicting a continuation of the apparatus of Fig. 6;

Figure 7 is a perspective view of forming rolls employed in the apparatus of Fig. 6;

Figure 8 is a sectional view taken on the line 8—8 of Fig. 6 with parts shown in elevation;

Figure 9 is a sectional view similar to Fig. 8 but illustrating a modified construction of the forming rolls;

Figure 10 is a perspective view of a modified construction of the forming rolls;

Figure 11 is a view partly in elevation and partly in section illustrating diagrammatically an apparatus which may be employed to produce shingles of modified forms in accordance with my invention, and

Figure 12 is a sectional view taken on the line 12—12 of Fig. 11 with parts shown in elevation.

Referring to the drawings and particularly to Figs. 1 to 4 thereof, a shingle 10 is depicted which embodies a preferred construction according to the present invention. The shingle 10 comprises a body portion 11 of a suitable hardened plastic material composed of bituminous material, such as asphalt or like waterproofing substance, mixed with fiber of any suitable character, and hardening fillers, such as finely divided solids as, for example, clay, talc, crushed slate, slate dust, cork, cork dust and the like. A convenient source of raw material that may be employed to form such a composition resides in scrap roofing that accumulates in the manufacture of felted, fibrous, asphaltic, prepared roofing. Since the latter is generally composed of asphalt constituting the waterproofing medium, fibrous material constituting the base, and mineral grit constituting the surfacing, scrap roofing of this nature is in most instances admirably suited for the purposes of this invention, but, if desired, there may be combined therewith further quantities of asphalt and further quantities of similar or additional fillers, e. g. cork, cork dust or the like to vary the composition and consistency of the mixture for the formation of the plastic mass as required in actual practice.

The plastic body portion 11 is preferably tapered in thickness from a maximum thickness at the butt end of the shingle to a minimum thickness at or adjacent the opposite end thereof, although the shingle may be made of uniform thickness throughout, if desired. The underside of the plastic body portion 11 is provided with a plurality of depressions 14 defined by longitudinally extending ribs 15 and transversely extending ribs 16. The outer longitudinally extending ribs 15 constitute portions of the side walls 17 of the body portion and a transversely extending rib 16 constitutes a portion of the end wall 18 thereof. The numbers, areas and depths of the depressions are made such that the depressions constitute a substantial portion of the volume of the shingle body as determined by its over-all dimensions. For example, a shingle 12 inches by 16 inches may have its undersurface divided into say from 20 to 200 or more depressed areas defined by narrow ribs of the plastic material. Where the shingle is made of uniform thickness throughout, the depressions are provided, at intervals as determined by the transverse ribs, for the full length thereof and preferably are made of equal depth which may be say equal to one-half the thickness of the shingle. However, according to the preferred form of the invention in which the shingle is made of tapering configuration, the depressions are preferably successively shallower as they approach the upper end of the shingle and also preferably individually diminish in depth in the direction of the upper end of the shingle. The depressions most adjacent the upper end of the shingle merge with the undersurface of the shingle along the line 19 (see Fig. 3). The bottoms of the depressions preferably lie in a plane parallel to the plane of the upper surface of the shingle.

The plastic body portion 11 may be reinforced against distortion and to resist sloughing and pulling away of the same from the nails, when the shingle is laid and subjected to solar heat, by a sheet 12 of a suitable weather-resistant material laminated to the upper surface of the body portion. The sheet 12 may preferably comprise an asphalt saturated felt material or the like. The reinforcing sheet 12 preferably covers the entire upper surface of the shingle body and carries on its exposed surface a coating of asphalt or other weather-resistant material in which is partially embedded a comminuted grit 13 such as crushed slate, crushed slag or the like which may be of any desired color. The preferred asphalt coating comprises a layer deposited from a mixture of a clay type emulsion of asphalt in water with a suitable quantity, say in an amount equal to the emulsion, of Portland cement or the like. A molten, preferably high melt-point asphalt may, however, be employed as the coating material or, if desired, other known types of coating and/or surfacing materials may be used in lieu of the asphalt emulsion or molten asphalt coatings and the mineral grit surfacing.

In the modification of the invention depicted in Fig. 5, the shingle 20 comprises a plastic body portion 21 similar in construction to the plastic body 11 of the shingle of Figs. 1 to 4. In this form of the invention a thin backing sheet 25, preferably comprising asphalt saturated felt or the like, is applied to the undersurface of the body portion and adhesively secured to the outer surfaces of the longitudinally and transversely extending ribs and to the entire undersurface of that portion of the body extending from the line of mergence of the depressions with the undersurface, indicated at 29, to the upper end of the same. Thus the backing sheet 25 covers the entire underside of the body portion and encloses depressions 24. The upper surface of the body portion of a shingle of this form may be provided with a suitable weather-resistant covering which may comprise a coating of asphaltic material 22 in which is embedded a surfacing of comminuted grit material 23 such as crushed slate or the like. The coating material 22 preferably comprises a layer deposited from an emulsion of asphalt in water and containing Portland cement or the like, similarly as the coating for the facing sheet 12 of the shingle of Figs. 1 to 4. However, a coating of molten high melt-point asphalt or other coating materials may be employed in lieu of the emulsion coating, if desired. For some purposes an especially well reinforced shingle may be required. To obtain such a shingle, a facing sheet carrying the coating and surfacing may be applied to the top surface of the shingle shown in Fig. 5 in lieu of the coating and surfacing directly applied to the plastic body portion as shown.

In the construction of the shingles of the present invention, I preferably first form a homogeneous plastic mass of bituminous material such as asphalt of, say, from 140 to 280° F. melt-point and hardening fillers, the mixture being worked up and brought to the desired consistency in any suitable form of kneading mechanism. As heretofore stated, prepared asphalt roofing scrap may

be employed for this purpose combined, if desired, with further quantities of bituminous material and/or fillers such as slate dust, talc, cork, cork dust and the like.

In the formation of shingles of the construction depicted in Figs. 1 to 4, the above described mixture in a hot and plastic state is fed from a suitable storage supply **30** (see Fig. 6) in a continuous flow through an extrusion nozzle **31** and between the opposing surfaces of a pair of co-operating forming rolls **32** and **33** mounted for rotation at equal peripheral speeds, in the directions indicated by the arrows, upon parallel shafts **34** and **35** respectively. The rolls **32** and **33** are driven from any suitable or convenient source of power (not shown). The lengths of the forming rolls **32** and **33** may be made such as to form a single strip of the plastic material of a width equal to the transverse dimension of the shingles. However, preferably these rolls are of such length as to provide a plurality of plastic strips of shingle width. For this purpose the roll **32** (see Figs. 6, 7 and 8) is provided with flanges or collars **36** at the ends thereof and an intermediate collar or collars **37** dividing the roll lengthwise into a plurality of sections each of a length equal to the transverse dimension of the shingles to be formed. The forming roll **33** similarly is provided with end collars or flanges **38** and an intermediate collar or collars **39** the spacing between these collars being equal to the spacing between the collars on the roll **32**. The combined depths of the collars is made substantially equal to the thickness of the body portion of the shingle and the shafts **34** and **35** of the rolls are so placed that corresponding flanges of the rolls are in substantial rolling contact at the bight therebetween whereby a plurality of adjacent shingle molds are provided between the opposing surfaces of the rolls. Adjacent the rolls **32** and **33** are spray nozzles **57** and **58** connected to any suitable water supply and mounted to direct a cooling spray against the surfaces of the rolls.

The roll **32** is provided with a smooth surface between adjacent collars. Each of the circumferential areas between adjacent collars of the roll **33** are indented to provide a plurality of grooves **50** extending longitudinally of the roll and a plurality of grooves **51** extending circumferentially of the roll, the grooves intersecting to define intermediate projections or protuberances **52**. The longitudinally extending grooves **50** have their side walls rounding upwardly and outwardly to impart a gear-tooth-like configuration to the corresponding walls of the projections and the grooves **51** may preferably have their side walls slanting or rounding upwardly and outwardly (see Figs. 6, 7 and 8) whereby the projections defined by the grooves may be withdrawn from the plastic as the roll **33** rotates without undue distortion of ribs of the plastic material molded by the grooves. For the construction of a tapered shingle as illustrated in Figs. 1 to 4, the longitudinally extending grooves **50** successively vary in depth from those of a minimum depth at the points x and y on the roll **33** to those of a maximum depth on either side of a longitudinally extending knife blade **53**. The circumferentially extending grooves **51** similarly vary in depth from zero depth adjacent the points x—y to a maximum depth where they intersect with the longitudinally extending grooves adjacent the blade **53**. It follows that the heights of the protuberances **52** will taper off from a maximum adjacent the blade **53** to a minimum adjacent the points x and y.

Located adjacent the roll **32** is a reel **54** rotatably mounted on a shaft **55** supported in parallelism with the shaft **34** of roll **32**. The reel **54** supports a plurality of ribbons **56** of a suitable reinforcing material such as asphalt saturated felt or the like, the ribbons **56** being drawn from the reel and passed around the forming roll **32** to lie against the smooth surfaces thereof and between the plastic material and the roll (see Figs. 6 and 8). The knife blade **53**, previously referred to, is of a depth to extend toward the roll **32**, when it is in position at the bight between the rolls, with its cutting edge spaced a small distance from the roll **32**. Diametrically opposite the blade **53** on roll **33** a second blade **53a** is provided which is also of such depth that its cutting edge nearly, but not quite, contacts the roll **32** when it is in position at the bight between the rolls. The blades **53** and **53a** thus substantially sever the plastic and the reinforcing material on spaced lines, the material on opposite sides of the lines of severence being connected only by thin readily tearable webs. A similar effect may be obtained by forming the blades **53** and **53a** with serrated edges to partially cut through the thickness of the plastic and to provide a line of perforations through the remaining portions of the thickness of the plastic and of the ribbons.

The plastic material forming the body portion of the shingles is, as previously stated, fed from the storage supply **30** between the rolls **32** and **33** where it is compressed and forced into contact with the reinforcing material **56** and into the grooves **51** and **52** of forming roll **33**. The ribbons of reinforcing material are adhesively secured to the plastic material during the molding thereof by the asphaltic constituent of the plastic. The circumferential dimension of the rolls **32** and **33**, as shown, is preferably made equal to the length of two shingles. Hence each of the molds constituted by the co-operating forming rolls acts, upon each revolution of the rolls to mold a section of a continuous plastic sheet, the portions of the section formed by co-operation of the areas z—x and z—y of roll **33** with roll **32** being of uniform thickness and the portion of the section formed by co-operation of the area x—y of roll **33** with roll **32** varying in thickness from a minimum thickness at its ends to a maximum thickness at a line midway between its ends. It will thus be seen that the molding of the longitudinally and circumferentially extending ribs in the mastic material by the grooves **50** and **51**, of successively diminishing depth and of gradual varying depth respectively, results in simultaneously imparting to the shingle a cross section (lengthwise of the shingle) which is of tapering thickness measured from the outer surfaces of the ribs formed by the grooves. Each revolution of the rolls will thus provide in each molding section thereof two shingle elements, each comprising a body portion having recesses extending thereinto from one surface thereof and a facing member secured to the other surface of the body portion, the elements being connected together by thin readily tearable portions left by the cutting blades **53** and **53a**. The portions of the shingles extending from the grooves of minimum depth to their upper ends will be uniform in thickness. If desired, however, this portion of the shingle may also be tapered by proper shaping of the portions z—x and z—y of roll **33** as will be readily apparent. The shingle sec-

tions thus formed will have body portions of the type illustrated in Figs. 1 to 4. As shown in said figures, the longitudinally extending ribs 15 taper in depth from the butt end of the shingle to a point 19 (see Fig. 3) adjacent the upper end thereof and the transversely extending ribs 16 are successively lesser in depth, the rib at the butt end of the shingle and the rib adjacent the line 19 being respectively of maximum and minimum depth. The cross-sectional configuration of the ribs is substantially the complement of that of the grooves of the roll 33.

According to a modification of the construction described above, the forming roll 43 (see Fig. 9), otherwise of the form of the roll 33 of Fig. 6, is provided with end collars 48 and an intermediate collar 49 having knife-like edges. The other forming roll 42, in this instance is smooth surfaced throughout, that is, no collars are provided thereon. The collars 48 and 49 on roll 43 are of such depth that their knife edges substantially contact the surface of the roll 42 at the bight between the rolls. The reel 54 carries a sheet of the facing material 56 of a width to extend the length of the rolls. In the construction of the shingle elements by the modified device, the operation is similar to that described above for the apparatus of Fig. 6 except that the knife blades formed on the collars 48 and 49 of roll 33 sever the wide facing sheet 56 into the strips of shingle width at the same time that the plastic material is molded between the forming rolls and secured to the facing material.

The forming rolls 32 and 33 have been described as having a circumferential dimension such as to form two shingle elements for each revolution thereof. It will be apparent, however, that these rolls may be so constructed as to form a greater number of shingle elements during each revolution of the same, if desired.

The forming rolls according to a further modification may be constructed to mold the plastic material into shingle elements extending longitudinally of the rolls. In this case the forming roll 90 corresponding to the roll 33 of Fig. 6 is (see Fig. 10) provided with collars 91 and 92, which may have the configuration of the collars as illustrated in either Fig. 8 or 9, spaced apart longitudinally of the roll a distance equal to the length of the shingles to be formed. The circumferentially extending grooves 93, in this instance, completely encircle the roll except for interruptions provided by knife blades 95 spaced apart a circumferential distance equal to the width of a shingle. The grooves 93 successively vary in depth between adjacent collars.

The longitudinally extending grooves 94 taper in depth from a maximum depth where they intersect the grooves 93 of greatest depth to zero depth adjacent the grooves 93 of least depth. The intersecting grooves define therebetween projections or protuberances 96. The cross-sectional forms of the grooves 93 and 94 are made similar to the cross-sectional forms of the grooves 51 and 50 respectively of the roll 33 of Figs. 6, 7 and 8 whereby no undue distortion of the ribs of the plastic material molded by the grooves will result. The forming roll 90 and its co-operating roll 97 may be of a length to mold one or more lanes of shingles, the roll depicted being of a length to mold two lanes of shingles, and may have a circumferential extent preferably equal to the width of two or more shingles. In the operation of the apparatus employing a forming roll as described above, the plastic material is molded by the mold sections provided by the co-operating forming rolls into lanes of shingle elements interconnected along their side edges by thin webs of the plastic and/or facing sheet not acted upon by the knife blades 95.

The lanes of interconnected shingle elements, formed in any of the manners described above, pass from the forming rolls and are supported by a suitable means such as the endless belt 61 carried by pulleys 60 or the like. The endless belt is driven in such a manner as to have the upper stretch thereof travelling at a speed equal to the rate at which the interconnected shingle elements leave the forming rolls. In order to maintain the plastic mass in a suitable condition for the extrusion and forming operations, it is necessary that it be at a relatively high temperature. The mastic material after it leaves the forming rolls retains a substantial quantity of this heat, and suitable cooling means for the same is advantageously provided at this point. The cooling means as indicated in Fig. 6 may comprise a series of spray nozzles 62 mounted to direct their sprays onto the upper surfaces of the interconnected elements and connected to a header or headers 63 supplied with water from some suitable source. A second series of spray nozzles 64 connected to a header 65 may also be provided to direct a cooling spray against the undersurface of the plastic material. The spray nozzles 64 are located between the upper and lower reaches of the belt 61, which is made of a foraminous or other open construction, whereby the spray from the nozzles may be directed through the belt and against the undersurface of the plastic material. It will be readily apparent that other cooling mediums may be used in place of the water sprays, for example, air jets similarly located may be employed. Furthermore, no special cooling means need be employed if a sufficient length of the interconnected elements be left exposed to the normal cooling effects of the surrounding atmosphere before subsequent operations are performed thereon.

Supported above the endless belt 61 is a coating applicator 68 which may comprise a spout or series of spouts 69 delivering the coating material from any suitable source of supply to the upper surfaces of the lanes of interconnected elements and a spreader or doctor roll 70. The doctor roll is suitably mounted (as shown) to rise and fall in conformity with the variations in thickness of the endwise interconnected elements delivered from the forming rolls as illustrated in Figs. 6, 7 and 8. Where, however, the shingle elements are delivered in side to side interconnected relationship as from a forming roll as depicted in Fig. 10 the doctor roll is given a surface configuration in conformity with the transverse contour of the upper surface of the lanes of interconnected shingle elements. The coating materials supplied to the spout 69 may comprise a high melt-point asphalt in molten and readily flowable condition. Alternatively an emulsion of asphalt in water may be employed as the coating material, the coating in this instance preferably being prepared by intermixing in an asphalt emulsion in which a clay, e. g., bentonite, preferably constitutes the dispersing medium, a quantity of a suitable weighting or rigidity imparting material such as Portland cement. The proportion of cement employed will be such as to provide a coating of desired consistency and may be, say, approximately equal in volume to the asphalt emulsion. An emulsion coating material of

this type exhibits the advantages that inasmuch as it is applied in a cold state it serves as an additional cooling medium for the plastic sheet. Furthermore, the heat given off by the plastic material, which may not be completely cooled at this point, serves to drive off or to substantially aid in driving off the aqueous phase of the emulsion to deposit therefrom an asphalt-cement layer of high resistance to flow under heat.

The lanes of interconnected shingle elements after leaving the coating applicator 68 pass beneath hoppers 71 of any suitable construction which contain a comminuted grit material such as crushed slate or the like of any desired color. The comminuted grit is showered upon the coated surfaces of the interconnected elements while the coating is in a plastic state and is partially embedded therein by suitable means. The embedding means may, as shown, comprise a roller 72 either yieldably mounted as at 74 to rise and fall as is necessary to follow the variations in the thicknesses of the shingle elements, co-operating with an underlying roll which may preferably comprise the end pulley 60 which supports the belt 61, as illustrated in Fig. 6, or having a surface contour to press evenly throughout the length of the elements when they are formed by rolls of the type illustrated in Fig. 10.

The several lanes of coated and surfaced interconnected shingle elements after leaving the embedding rolls 72 and 60 pass to a second conveyor means (see Fig. 6a) which preferably comprises endless belts 77 and 79 supported respectively below and above the plane of travel of the interconnected elements by pulleys 76 and 78. The upper stretch of the belt 77 and the lower stretch of the belt 79 travel in the same direction but at a greater speed than the belt 61 and are so spaced relatively to one another as to bind the shingle elements therebetween. Thus, as the shingle elements enter between the faster moving belts 77, 79, a sufficient pull is provided on them to separate them along the weakened lines provided by the knife blades 53 and 53a. The disconnected individual shingles are carried by the belts 77 and 79 preferably to a receiving device 81.

The reinforcing material secured to the upper surface of the plastic body portion of the shingle illustrated in Figs. 1 to 4 may constitute asphalt saturated felt or the like carrying a preapplied coating and surfacing. For example, conventional mineral surfaced roofing may be supplied on the reel 54 of the apparatus of Fig. 6. In this case the knife blades 53 and 53a of forming roll 53 are preferably made of such depth as to cut completely through the plastic and facing sheet. Thus the shingle elements are completely formed and separated into individual elements by the forming rolls and may be permitted to fall onto a belt, for example, as that shown at 61 in Fig. 6 and be conveyed directly to a receiving device inasmuch as no further coating or surfacing operations are required.

An apparatus for use in the formation of shingles of the type depicted in Fig. 5 is diagrammatically illustrated in Figs. 11 and 12. The forming rolls 132 and 133 may be of the configuration of the forming rolls 32 and 33 of Fig. 6 or may be of the form required to provide shingle elements interconnected at their side edges as produced by a forming roll as shown in Fig. 10. In the apparatus illustrated in Figs. 11 and 12, the forming rolls 132 and 133 are similar in form to rolls 32 and 33 of Figs. 6, 7 and 8 and the remaining parts of the apparatus are constructed to operate on lanes of interconnected elements formed by rolls of this type. The changes necessary to permit the use of the forming roll of Fig. 10 will, however, be obvious to one skilled in the art. The plastic material in heated condition and comprising bituminous material and hardening fillers is supplied from a suitable hopper 130 and fed directly between the opposing surfaces of the forming rolls. The lanes of interconnected elements thus formed pass from the forming rolls to rest upon strips 137 of a weather-resistant material such as asphalt saturated felt supplied from a reel 138 and extending over a roll or the like 139. The lanes of interconnected elements with their thus associated backing strips 137 thence pass between the co-operating faces of a pair of pressure rolls 140 and 141. The roll 141 is yieldably mounted by suitable means such as that indicated at 142 to rise and fall as is necessary to permit the roll to exert a substantial uniform pressure on the upper surface of the endwise interconnected tapered shingle elements irrespective of the variations in thickness thereof.

The lower roll 140 is provided with a plurality of collars 142 defining recesses therebetween, the length of the recesses being substantially equal to the width of the shingles formed by the rolls 132 and 133 and the number of the recesses longitudinally of the roll being equal to the number of lanes of interconnected elements formed by the rolls. The strips 137 of asphalt saturated felt, each of a width of a shingle element, are drawn from the reel 138 and passed over the roll 140 to lie in the bottoms of the recesses thereof and are pressed against the bottoms of the ribs of the single elements by the pressure of the roll 141. The pressure between the rolls 140 and 141 is made sufficient to firmly press the felt to the ribs of the shingle elements to cement the felt thereto either by the asphaltic constituent of the plastic of which they are composed or by a suitable waterproof adhesive, e. g. an asphalt emulsion, which may, if desired, be applied to the upper surface of the felt sheet. The interconnected shingle elements with their attached backing sheet pass from the rolls 140 and 141 to a supporting conveyor 161 which carries the interconnected elements between water sprays or similar cooling means 162 and 164, and beneath coating and surfacing means in a like manner to that illustrated for the conveyor 61 of Fig. 6. The shingle elements are then separated along the weakened lines between adjacent shingles in any suitable manner.

For the formation of shingles having reinforcing sheets on both their upper and lower surfaces, the apparatus of Fig. 11 is provided with a reel 180 adjacent the forming roll 132, rotatably mounted on a shaft 181 which lies in parallelism to the shaft 134 of the forming roll. The reel 180 supports a plurality of strips of the felt or similar material to be employed for the facing of the upper surface of the shingles. The strips 182 are extended around the roll 132 and secured to the upper faces of the shingle elements as they are molded, similarly as are the strips 56 in the device of Fig. 6.

Having thus described my invention in rather full detail, it will be apparent to one skilled in the art that these details need not be strictly adhered to, but that various changes and modifications may readily suggest themselves without departing from the scope of the invention as de-

fined by the appended claims. The term "shingle" is used herein in a broad sense and is intended to include strip shingles and similar roofing or siding elements as well as individual shingles.

What I claim is:

1. A roofing element of the character described comprising a body portion of hardened plastic material composed of bituminous material and hardening fillers, the body portion tapering in cross section from a relatively thick butt end to a relatively thin upper end, the underside of said body portion being formed with a plurality of depressions defined by transversely and longitudinally extending ribs, the depressions progressively decreasing in depth from said butt end of the element to a point adjacent the upper end thereof and the successive depressions longitudinally of the element tapering in depth in conformity with the tapering cross section of the body portion, and a sheet of backing material secured to the undersurface of said body portion and bridging the depressions therein.

2. A roofing element of the character described comprising a body portion of hardened plastic material composed of bituminous material and hardening fillers, the body portion tapering in cross section from a relatively thick butt end to a relatively thin upper end, the underside of said body portion being formed with a plurality of depressions defined by transversely and longitudinally extending ribs, the depressions progressively decreasing in depth from said butt end of the element to a point adjacent the upper end thereof and the successive depressions longitudinally of the element tapering in depth in conformity with the tapering cross section of the body portion, a sheet of backing material secured to the undersurface of said body portion and bridging the depressions therein, and a weather-resistant material on the upper surface of said body portion.

LESTER KIRSCHBRAUN.