

[54] **FLOOR STRUCTURE**
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[51] Int. Cl. **E04f 15/10**
[58] Field of Search 119/28; 51/586, 588, 598, 51/599

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[57] **ABSTRACT**
A concrete underfloor has an arched upper surface provided with recesses. A plurality of floor lining strips of rubber or plastics are arranged side by side on the underfloor. Each strip has a bottom part in contact with the concrete, at least two downward-directed projections engaging the corresponding recesses in the underfloor, an arched top portion integral with the bottom portion in the region of the projections and defining with the intermediate part of the bottom portion an elongated cavity.

15 Claims, 5 Drawing Figures

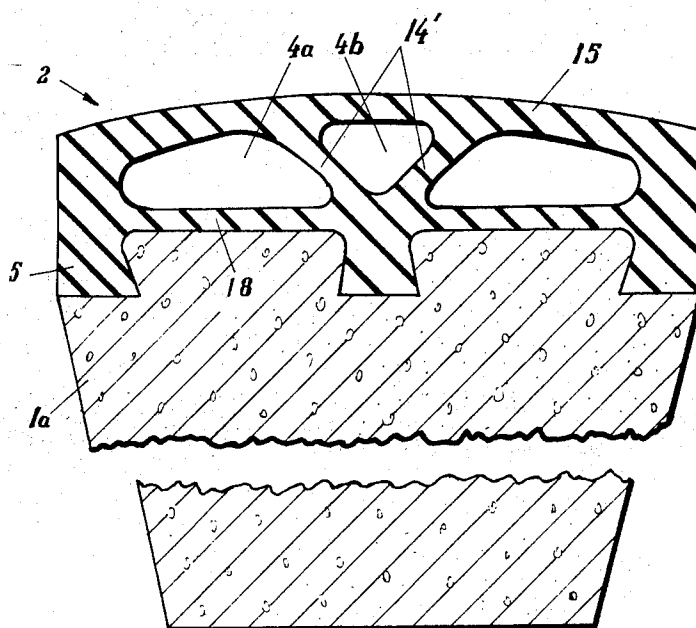


Fig. 1

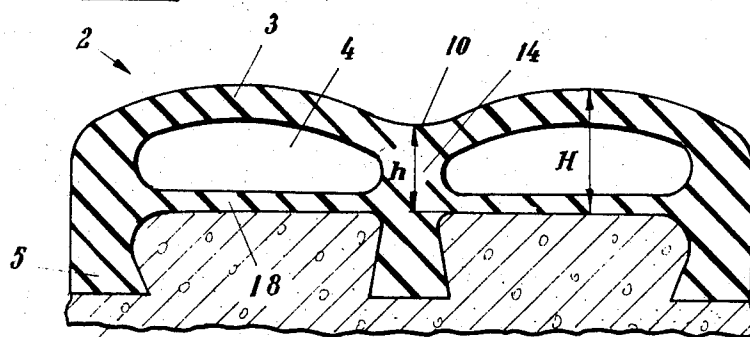


Fig. 2

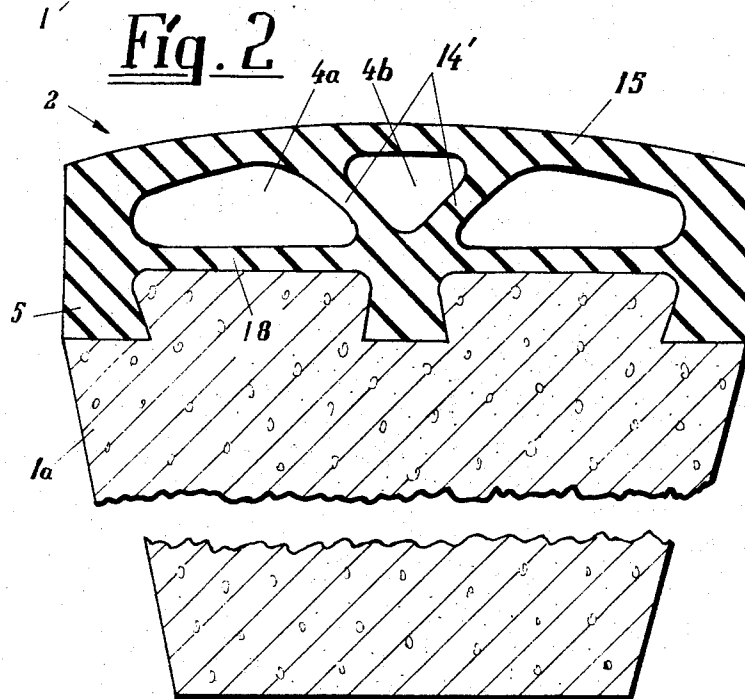


Fig. 3

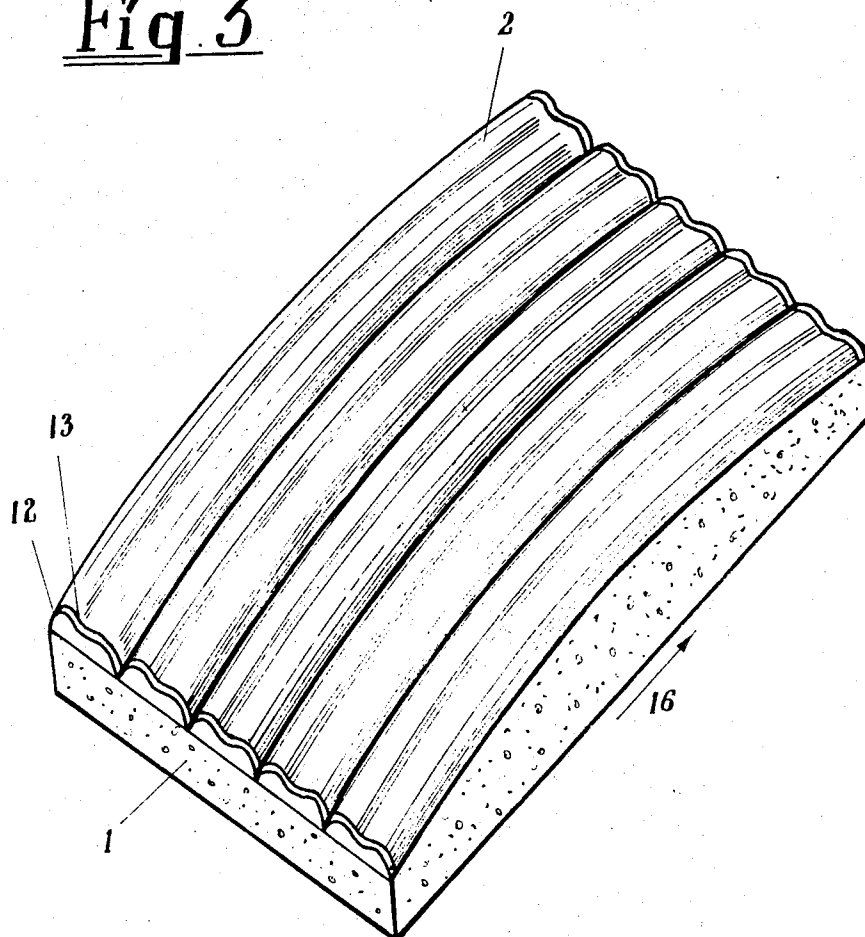


Fig. 4

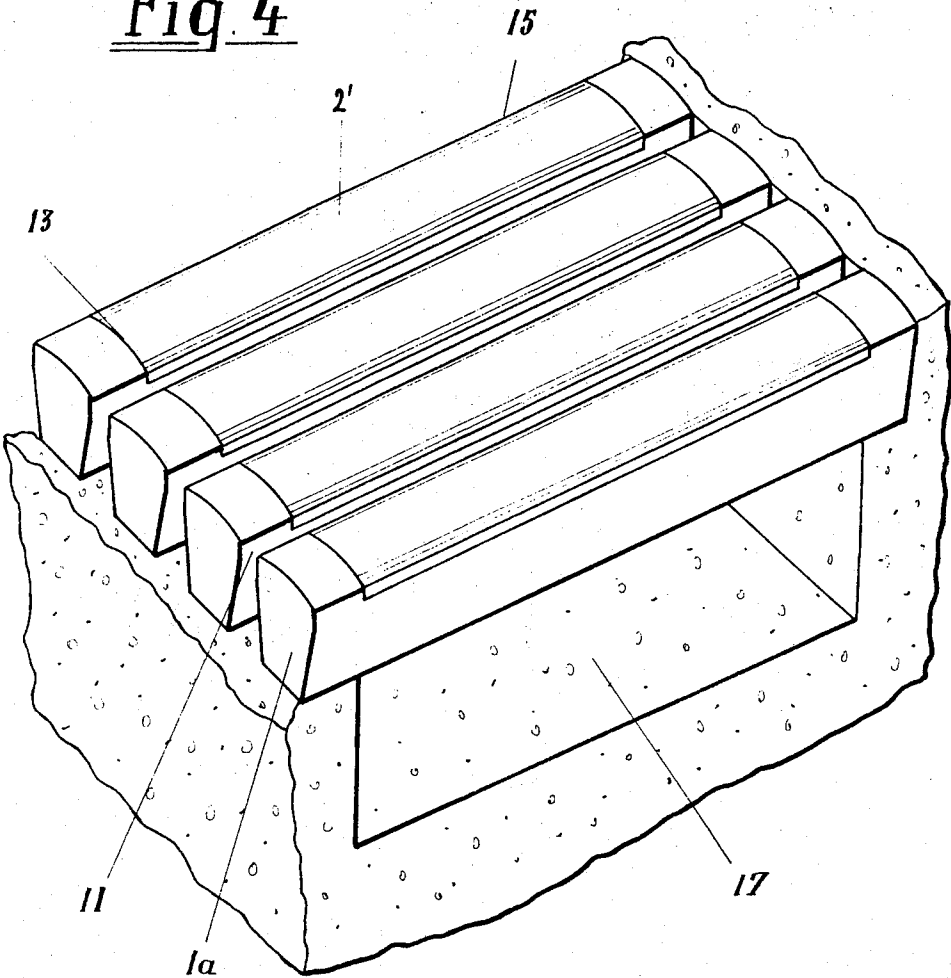
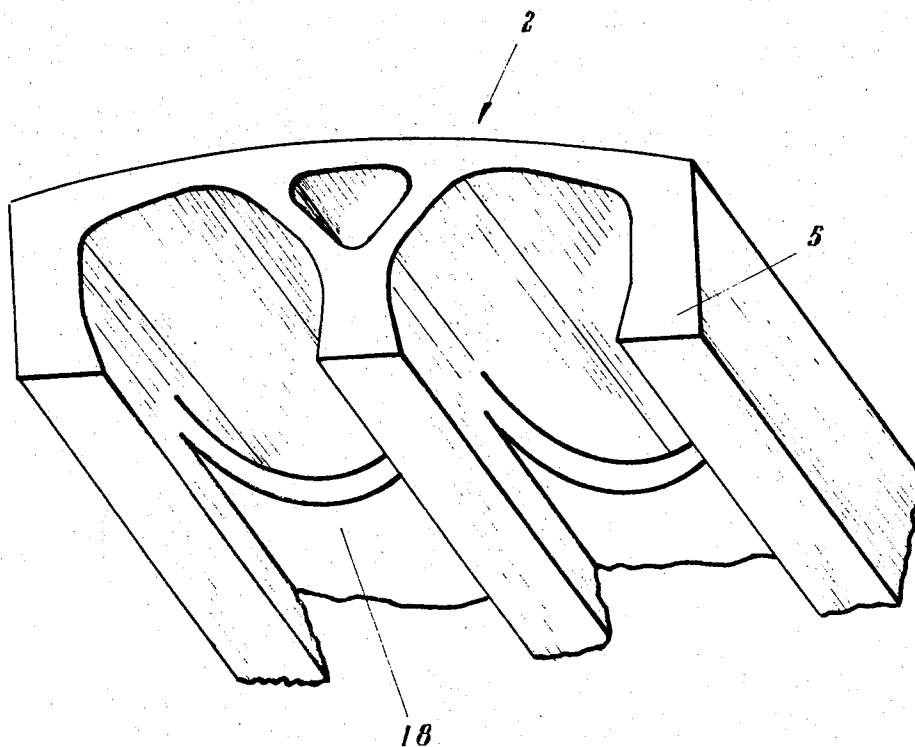


Fig. 5



FLOOR STRUCTURE

BACKGROUND OF THE INVENTION

The present invention relates to floor structures.

There is disclosed in German Patent Publication No. 2,055,959, a floor structure which is particularly useful for cattle stalls, which structure comprises a floor lining of rubber or synthetic plastics material and an underfloor. The floor lining has substantially downward-directed projections which engage in corresponding recesses in the underfloor, part of the lining located between the projections being arched in relation to the underfloor and thus forming cavities.

This kind of floor structure provides for the cattle a soft, anti-slip area on which to lie, which at the same time is a good insulator. However, in the practical application of this kind of floor structure difficulties have been encountered. If all of those portions, of the lining located between the projections are arched and thus form cavities in relation to the underfloor, then when it is laid for example on new concrete, crumbling can occur and the fragments thus produced reduce the cross-section of the cavities in an uncontrolled manner so that the resilience of the lining becomes very irregular. When the arched profile is trodden down, the inside of the material scrubs against the surface of the underfloor which may be, for example, rough concrete. Moreover particularly where substantially cylindrical arched lining profiles are used, these open profiles are extremely difficult to manufacture in an economical extruding operation.

An object of the invention is to overcome these drawbacks.

SUMMARY OF THE INVENTION

The invention therefore consists in a floor structure comprising a floor lining of rubber or synthetic plastics material and an underfloor, the floor lining having substantially downward-directed projections which engage in corresponding recesses in the underfloor and parts of the lining located between said projections being arched in relation to the underfloor to form cavities in the lining, wherein said cavities, at least viewed in cross-section, are surrounded on all sides by the material of which the floor lining is made.

Thus, the cavities are contained in the body of the floor lining itself so that when laying the floor lining on the underfloor, it is not only the projections but also a complete bottom surface area of the floor lining which comes into contact with the underfloor and protects the overlying cavities which are closed off at the top by the arched portions of the lining. The effect of the cavities on an animal lying on the floor or in relation to the hooves of standing or walking animals, is thus a more uniform one.

Advantageously, the floor lining may be produced as an extruded strip. By the formation of cavities in the cross-section of the extruded strip, the latter can be manufactured particularly simply and can, for example, if it is made of rubber, be subjected to a vulcanising operation, without experiencing any substantial distortion.

Although it is possible, depending upon the desired application, to use for the floor structure in accordance with the invention individual floor lining strips which, viewed in cross-section, contain only one cavity, it has

nevertheless been found advantageous if the floor lining strip, in cross-section, has at least two adjacent and substantially identical cavities which are separated by substantially vertical webs having a height which is less than the height of the floor lining in the cavity zone.

Thus, not only can the extrusion moulding machine be more inventively exploited, but the operation of laying can be rationalised too. Moreover, there is a reduced likelihood of failure at the points between individual lining strips. The depressions formed between the arched portions which cover over the cavities, improve the elasticity and softness of the lining because the bodies or hooves of the cattle first of all make contact with the raised, arched points, and the depressions also facilitate discharge of water. Again, these depressions provide the skins of animals which are lying down, with a better opportunity to breathe.

The whole surface of the floor lining strip may be arched upwards, as viewed in cross-section. The effect of this kind of arching, which produces the aforementioned advantages, is reinforced by providing the floor lining, as seen in cross-section, with at least three cavities between which partition walls are disposed, said walls making an angle other than 90° and preferably an angle of substantially 45°, with the underfloor. By avoiding vertical partition walls, the desired cushioning effect is still further improved. It is also particularly advantageous to give the two outermost cavities substantially the same cross-sections, for example wing-shaped and possibly of enantiomorphic configuration and giving the centre cavity an approximately triangular cross-section. This kind of floor lining strip combines optimum resistance to high specific loading by cattle hooves, with optimum softness and elasticity, and thus optimum comfort for the animals when they are lying down.

Two different methods of arranging a floor structure in accordance with the invention have been found convenient. In the first case, the floor lining strips extend transversely of the standing and, seen in the longitudinal direction of the standing, the strips have no gaps, or at any rate only small ones therebetween being furthermore anchored in the underfloor in an upwardly arched fashion considered in longitudinal section and thus in the transverse direction of the standing. This arrangement uses a plurality of relatively short floor lining strips, substantially equal to the width of the standing which for example is about 80 cm, these strips succeeding one another over the full length of the standing. This arrangement amongst other things facilitates the lateral discharge of water, which only has a short distance to flow, particularly if the floor lining strips are anchored in the underfloor so that in the longitudinal section, i.e., in the transverse section of the standing, they are arched upwards. The shortness of the floor liner strips facilitates their laying in this case.

On the other hand, it has been found convenient to embed one or more floor lining strips in concrete slabs or beams of substantially the same width and to use these as finished elements for the manufacture of strip floors or cattle standings.

In order to still further improve the cushioning effect of the floor lining strips and to maintain this effect over the full period of service of the floor structure, it is preferable for the cavities in the floor lining strips to be closed off at least at one end. By this means, when suddenly compressed by cattle hooves, the air in the cavi-

ties is prevented from escaping too quickly and it is also ensured that the cavities do not, over a period of time, become blocked with dirt and refuse from the ends of the strips, and thereby lose their cushion effect. Such accumulation of dirt and refuse would also form breeding grounds for infections or parasites. The closing off of the ends of the extruded strips can be produced by clamping them together, by cover sections adhered in place and/or by extending the material of the underfloor upwards, in extension of the strip, to reach the surface of the latter.

BRIEF DESCRIPTION OF THE DRAWINGS

Some exemplary embodiments of the invention will now be described with reference to the accompanying drawings in which:

FIGS. 1 and 2 each show an embodiment of a floor lining strip in cross-section and on an underfloor;

FIGS. 3 and 4 each show an embodiment of a floor structure in perspective and in the installed condition; and

FIG. 5 is a bottom view of the floor lining strip end.

DETAILED DESCRIPTION

FIG. 1 shows an underfloor 1 consisting for example of concrete, in which are embedded projections 5 of a striplike lining 2. The lining is provided, in arched areas 3, with cavities 4 having an elongated, flat section. These cavities in the lining are, viewed in cross-section, surrounded on all sides by the material of the lining 2. In this embodiment the cross-section of the floor lining strip 2 have two cavities 4 which are separated by a web 14 having a height h which is less than the height H in the arched area 3 so that between the two arched areas 3 a groove or depression 10 is formed.

In the embodiment shown in FIG. 2, the projections 5 of a floor lining strip 2' are embedded in a substructure 1a having a beamlike cross-section. The floor lining 2' in this case has three cavities in its cross-section, the two outer ones 4a of which correspond to the elongated flat cavities 4 of the first embodiment, but have a wing-shaped profile, their configurations being enantiomorphically related. Between them there is a cavity 4b which, in cross-section, is substantially in the form of an inverted triangle, provided by two webs or internal partition walls 14' located obliquely at about 45° to the lower surface of the strip, each of which also forms a wall of a cavity 4a. The surface 15 of the floor lining strip 2' is arched upwards, viewed in cross-section. Both in FIG. 1 and in FIG. 2, the horizontally-disposed bottom portion 18 of the lining strip 2 protects the arched portion or portions from the concrete surface.

FIG. 3 shows a plurality of floor lining strips 2 laid in an underfloor 1 and running in a direction 16 which is transverse to that which will be assumed by standing cattle. The ends 13 of the strips 2, which extend along the sides of the standing, are closed or sealed off by cover elements 12 which are fixed in position by an adhesive or otherwise adhered. According to another feature of this invention, the whole surface of the floor lining strips is arched or domed upwards also in the longitudinal direction 16.

FIG. 4 shows a floor structure in which floor lining strips 2' are incorporated into beam-like concrete substructures 1a having the same width as the strips 2'. At

each end 13 of the strips 2', the beam-like concrete substructure 1a is flush with the top surface 15 of the strips 2' so that the cavities in the extruded strips, which would otherwise be exposed, are closed off. Between the beam-like elements, there are spaces 11 through which faeces can be discharged into a pit or a duct 17.

FIG. 5 is a view from below of the end of a floor lining strip 2 designed for embedding in concrete for example. At this end and over a short length of about 4 cm, the bottom part 18 of the strip 2 is cut out in order to enable a solid concrete stop to be formed at this location.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, which I claim as new and desire to be secured by Letters Patent, is as follows:

1. A floor structure, particularly for use in a stall, for example a cattle stall,

comprising in combination,

an underfloor of a substantially rigid material having

a plurality of undercut recesses,

a floor lining of resilient material including

elongated members each having

a bottom portion in contact with said underfloor, and

each including downwardly directed projections

engaging said recesses in said underfloor,

a top portion integral with said bottom portion in the

region of said projections and having an arched

part directed upwards in the zone between said

projections to define with said bottom portion at

least one elongated cavity.

2. A floor structure as claimed in claim 1, wherein each elongated member is an extruded strip.

3. A floor structure as claimed in claim 2, wherein each strip, viewed in cross-section, has at least two adjacent similar cavities separated by upright webs having a height which is less than that of the arched parts of the lining.

4. A floor structure as claimed in claim 2, wherein the whole surface of the floor lining viewed in longitudinal direction of said strip is arched upwards.

5. A floor structure as claimed in claim 2, wherein each strip viewed in cross-section has at least three cavities, partition walls between said cavities, said walls making an angle other than 90° with the underfloor.

6. A floor structure as claimed in claim 5, wherein the two outermost cavities have a similar cross-section, and the center cavity has an approximately triangular cross-section.

7. A floor structure as claimed in claim 2, said stalls being elongated, wherein several of said floor lining strips extend side by side on said underfloor transversely to the direction of elongation of said stalls.

8. A floor structure as claimed in claim 7, wherein said underfloor is arched transversely to the direction of elongation of said stalls.

9. A floor structure as claimed in claim 2, wherein at least one of the ends of said cavities in the floor lining strips are closed off.

10. A floor structure as claimed in claim 9, wherein there is included means for clamping together the open ends of each floor lining strip.

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11. A floor structure as claimed in claim 9, wherein there are included cover elements adhered to the end face of each floor lining strip.

12. A floor structure as claimed in claim 9, wherein the underfloor material comes up against the ends of the floor lining strips.

13. A floor structure as claimed in claim 9, wherein each floor lining strip is embedded in a concrete beam of substantially the same width, the concrete extending beyond the ends of the strips and reaching the top level thereof.

14. A floor structure, particularly for use in a stall, for example an elongated cattle stall, comprising in combination, an underfloor that is arched transversely to the direction of elongation of the stall and made of a substantially rigid material having a plurality of recesses, a floor lining of resilient material including elongated, extruded strip members extending side by side on said underfloor transversely to the direction of elongation of the stall and each having a bottom portion in contact with said underfloor, and each including downwardly directed projections engaging said recesses in said underfloor, a top portion integral with said bottom portion in the

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region of said projections and being arched upwards in the zone between said projections to define with said bottom portion at least one elongated cavity.

15. A floor structure, particularly for use in a stall, for example a cattle stall, comprising in combination, an underfloor of a substantially rigid material having a plurality of recesses, a floor lining of resilient material including elongated, extruded strip members each having a bottom portion in contact with said underfloor, and each including downwardly directed projections engaging said recesses in said underfloor, a top portion integral with said bottom portion in the region of said projections and being arched upwards in the zone between said projections to define with said bottom portion at least one elongated cavity, the ends of which are closed off, said underfloor being defined by a concrete beam in which said strip members are embedded, said concrete beam being of substantially the same width and extending beyond the ends of said strip members, said concrete beam reaching the top level of said strip members.

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