Aug. 11, 1964 F. E. SHRIMPLIN ETAL 3,144,545

HEATING ASSEMBLY

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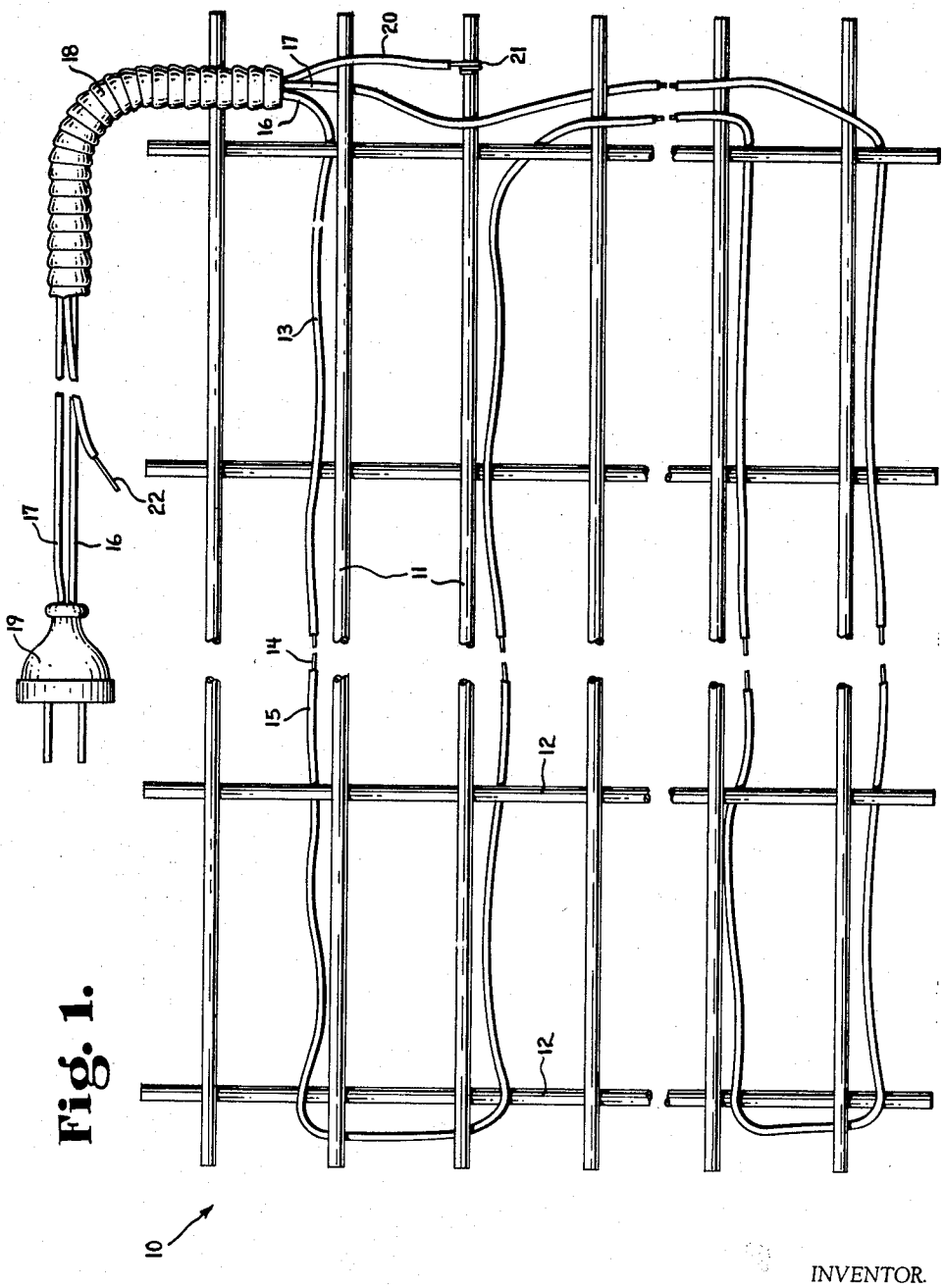

Fig. 1.

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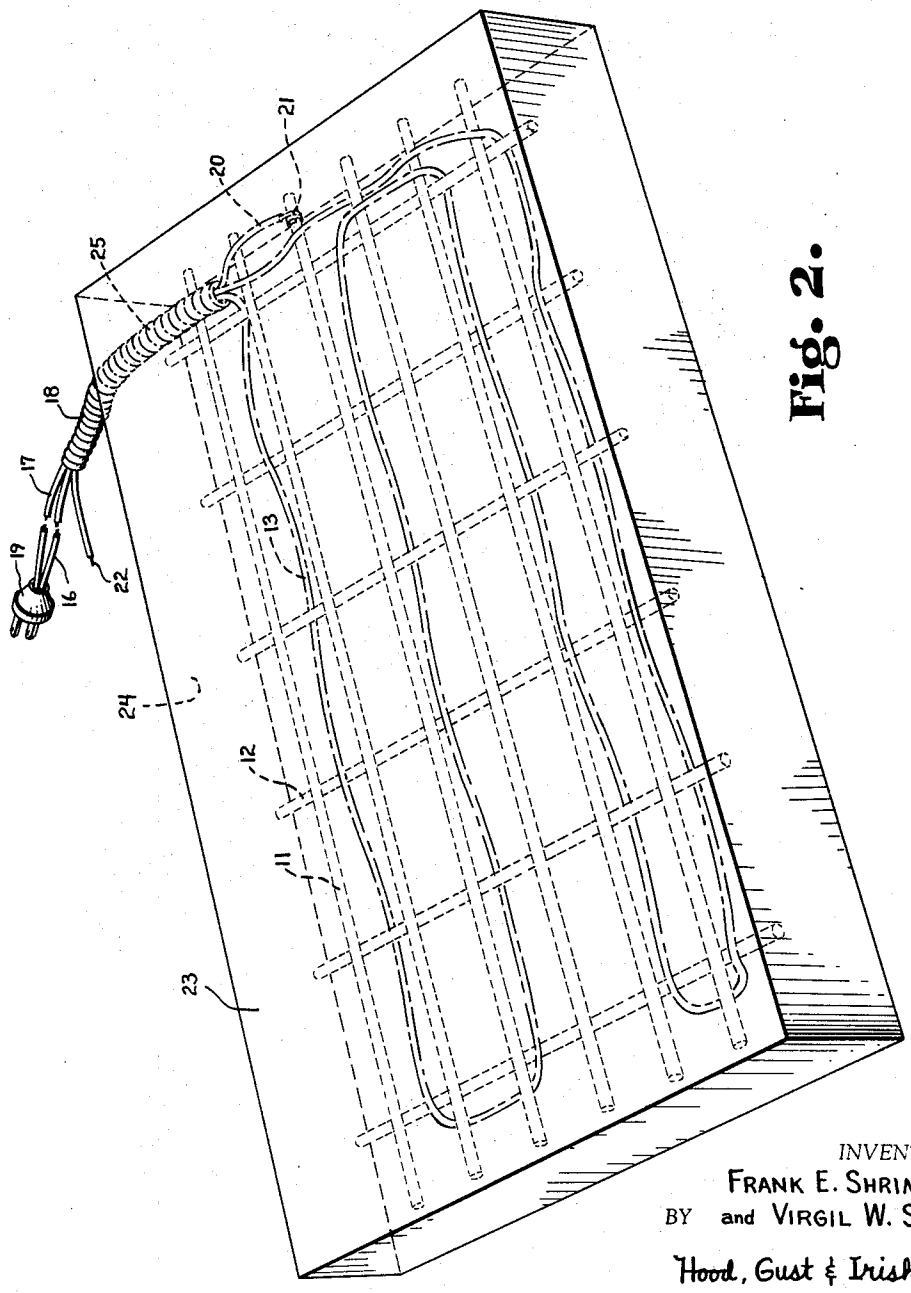

Fig. 2.

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HEATING ASSEMBLY

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The present invention relates to a heating assembly, and more particularly to such an assembly which comprises a rigid grille upon which is loosely woven an electrical resistance element, the entire assembly being adapted to be embedded in a slab of suitable material such as, for instance, any of the well known synthetic plastics which are adapted to be formed to desired shape, concrete, asphaltic materials and the like, wherein the rigid grid will effectively reinforce the slab against fracture or cracking and the electrical resistance element, when energized, will warm at least one major surface of the slab.

A primary object of the invention, then, is to provide an improved heating assembly comprising rigid reinforcement means and a heating means supported therefrom.

A further object of the invention is to provide such an assembly which shall be effective to overcome the functional disadvantages of previously known devices having similar broad objectives.

A further object of the invention is to minimize the cost of such a heating assembly, while providing for substantially uniform distribution of heat over a major surface of a slab in which such an assembly is embedded.

Still further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, our invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific construction illustrated and described, so long as the scope of the appended claims is not violated.

FIG. 1 is a plan view of a preferred form of heating assembly constructed in accordance with the present invention; and

FIG. 2 is a perspective view of such a heating assembly embedded in a slab.

Referring more particularly to the drawings, it will be seen that we have illustrated a grid, indicated generally by the reference numeral **10** and consisting essentially of a plurality of longitudinally-extending, laterally-spaced, substantially parallel wires or rods **11** spanned by a plurality of transversely-extending, longitudinally-separated, substantially parallel wires or rods **12**, the rods **12** being welded to the rods **11** to produce an integrated structure. It is a critical feature of the grid **10** that the individual rods or wires **11** shall be sufficiently stiff so that the integrated grid possesses a degree of rigidity such as to protect a slab in which it is embedded against fracture or cracking resulting from rough handling or from temperature variations. In one satisfactory form of the invention which has been successfully used in the environment for which the heating assembly has been primarily designed, the rods or wires **11** and **12** constitute low carbon steel wire, 11-gauge or heavier, the rods **11** being spaced apart by approximately one inch and the rods **12** being spaced at intervals of approximately four inches.

In previously-known structures with which we are familiar, light wire mesh of the type usually referred to as "chicken wire" has been used to support an electrical resistance element fixedly secured to said mesh at spaced points in the length of such resistance element; and it has been found that such assemblies, when embedded in, for instance, concrete slabs, are not effective to protect

such slabs against serious damage in use and are not effective satisfactorily to distribute a suitable amount of heat over a major surface of such slabs. We have found, however, that when a grid of the type herein disclosed, formed from rod material having a strength and stiffness at least equivalent to that of 11-gauge low carbon steel wire, is made up in the manner above described, and when a resistance element of the character to be explained is associated therewith in the relationship herein illustrated, a slab in which the assembly is embedded is effectively protected and one of its major surfaces is effectively and substantially uniformly heated upon energization of the resistance element.

As shown, such a resistance element may preferably consist of a continuous strand **13** of conventional heater wire **14** having an insulating sheath **15** thereon. The insulated wire is woven loosely, in the manner illustrated, among the bars of the grid in a pattern consisting of a plurality of runs extending substantially parallel with the rods **11** and joined by transverse sections, as shown, the two ends **16** and **17** of the strand **13** extending, substantially together, a significant distance away from the grid and being electrically connected to the prongs of a conventional connector plug **19**. For a reason which will appear, we prefer to enclose the end portions **16** and **17** of the strand **13** in flexible, metal armor, as indicated at **18**, such armor having one end disposed within the boundaries of the grid **10** and extending for a significant distance away from the grid. Preferably, an insulated ground wire **20** has one end **21** electrically connected to an element of the grid **10**, extends through the armor **18** and has its opposite end **22** bared for effecting a suitable ground connection.

As has been explained, the heating assembly consisting of the grid **10** and the resistance element **13** supported thereon, is adapted to be embedded in a portable slab **23** formed of suitable, preferably monolithic material. The leads **16** and **17** and the distal end of the ground wire **20**, enclosed in the armor **18**, will emerge through one (preferably minor) surface **24** of the slab, a significant portion **25** of the armor being embedded in the slab, as clearly shown in FIG. 2. The heating assembly is preferably arranged in a plane parallel with the opposite, major surfaces of the slab; and it will be seen that, because of the arrangement of the resistance strand **13** upon the grid **10**, the top major surface of the slab will be quite uniformly heated when the resistance element is energized.

Such a slab, with its embedded heating element, is primarily useful as a bed for animals. For instance, it has long been recognized that, particularly in the temperate zone, the most advantageous time for farrowing piglets, from the market standpoint, is also the most hazardous time, since piglets are highly susceptible, during the first few weeks of their lives, to low temperatures. The normal body temperature of a baby pig is in the neighborhood of 100° F., and when atmospheric temperatures to which they are exposed fall below 32° F., particularly if the animals are wet, they can freeze to death in a very short time. Temperatures between 32° and 60° F. make piglets miserably uncomfortable and, particularly if they are simultaneously exposed to dampness, they are very like to contract pneumonia, influenza or other respiratory diseases which are frequently fatal. Furthermore, in seeking comfort when exposed to low temperatures, piglets will crowd and pile upon each other whereby those in the lowermost layers are frequently injured, crushed to death or suffocated.

According to the present invention, a slab having embedded therein a heating assembly of the character herein disclosed, is positioned on the floor of any suitable enclosure to provide a smooth, clean, heated surface on

which the piglets may lie in complete relaxation. Because the source of heat is the floor of the pen, each piglet seeks a spot of his own on the heated floor in preference to piling upon other piglets. Since the floor surface is heated from within and substantially uniformly throughout its area, it provides equal degrees of comform and protection against the cold for all of the piglets in the enclosure without crowding and without danger of injury.

The slab **23** is preferably thick enough so that, when it is laid on the earthen floor of a pen, its uppermost surface will be at a level such that mud and litter will not be scattered thereon to any substantial extent. Further, since the slab is monolithic and its uppermost surface can be quite smooth, it can be readily and frequently cleaned to maintain optimum sanitary conditions. The slab will be large enough, in its major dimensions, so that its upper surface will accommodate a significant number of piglets, preferably as many as normally comprise a single litter, stretched out comfortably and without undue crowding, but small enough, taking into consideration the material from which the slab is formed, so that it may be readily handled and moved from place to place by one man. The slab may be formed from Portland cement concrete, from molded or extrusion or thermosetting plastics or from other similar materials through which heat may be readily conducted. Thus it will be seen that we have used the term "monolithic" somewhat loosely; and that term is to be construed to include materials other than rock or concrete, so long as those materials are generally homogeneous.

In some instances, it may be desirable to use a plurality of slabs arranged in juxtaposition to cover a relatively large floor area; though we presently believe that ordinarily only one liter of piglets should be kept in a single enclosure.

Since pigs (and to some extent other animals and pets) will chew any available material and could readily bite through the insulation of the leads **16** and **17**, or even through the wires themselves, the provision of the armor **18** is highly desirable. For the same reason, we consider it important that the proximal end portion **25** of the armor shall be embedded within the body of the slab **23** so that, no matter what may happen, not even a short length of the wires **16** and **17** closely adjacent the slab may become accessible to the pigs. We presently believe that the armor **18** should extend a distance of at least three feet from the edge **24** of the slab. The leads **16** and **17**, of course, will extend far enough so that the plug **19** may be connected to a suitable source of electrical energy (not shown) at some remote point.

It is essential, of course, that the exposed, upper surface of the slab shall not be heated to a temperature such as to sear the hides or singe the coats of the pigs; and in some instances it may be desirable to install one or more thermostats within the length of the resistance element **13**; or a manually-adjustable thermostat may be connected in the leads **16, 17** in analogy to the conventional practice in electric blankets. In practice, however, we have found that the character of the heating element and the physical characteristics of the slab, as well as the electrical characteristics of the energy supply source, may be so selected that the temperature of the exposed surface of the slab will remain within the range between 70° and 80° F., even without the installation of thermostats, under weather conditions encountered within the temperate zone and during which energization of the heating element is required.

Since, whenever the heating element is energized, heat radiates continuously from the exposed surfaces of the

slab, there is a tendency for those slab surfaces to remain dry most of the time, and to dry off very quickly after wetting. Thus the slab disclosed herein gives new born piglets a warm, dry spot in which to rest and quickly become dry. Sufficient heat is radiated from the slab so that, even on very cold nights and even in installations in which the enclosure is a slatted pen, piglets will be saved from freezing and will be quite effectively protected against respiratory diseases resulting from temperature shock. In the same way, the device is disclosed, when installed in a dog house or encolsure for other pet, is highly attractive and very persuasive against night roaming.

We claim as our invention:

1. A combination heating and reinforcing structure adapted to be embedded in a portable slab, comprising a rigid grid made up of a plurality of substantially parallel, longitudinally-extending members and a plurality of substantially parallel, transversely-extending members bridging and welded to all of said longitudinally-extending members, an insulated electric resistance unit loosely woven through the mesh defined by said grid in a patterrn of substantially uniform distribution over the surface of said grid and free from attachment to said grid, and flexible, insulated electric leads connected to the ends of said resistance unit and extending freely to a significant distance away from said grid.

2. A portable, warmed animal bed comprising a portable, monolithic slab having embedded therein a rigid grid made up of a plurality of substantially parallel longitudinal members and a plurality of substantially parallel transverse members bridging and fixedly secured to said longitudinal members, an insulated electric resistance unit loosely woven through the mesh defined by said grid in a pattern of substantially uniform distribution over the surface of said grid and free from attachment to said grid, and flexible, insulated electric leads connected to the ends of said resistance unit and extending from said grid to emerge through an edge surface of said slab, said leads further extending freely to a significant distance away from said slab.

3. A combination heating and reinforcing structure adapted to be embedded in a portable slab, comprising a rigid grid made up of a plurality of substantially parallel, longitudinally-extending metal wires having a diameter of at least approximately one-eighth inch and a plurality of substantially parallel, transversely-extending metal wires having a diameter of at least approximately one-eighth inch bridging and welded to all of said longitudinally-extending members, an insulated electric resistance unit loosely woven through the mesh defined by said grid in a pattern of substantially uniform distribution over the surface of said grid and free from attachment to any of said wires, and flexible, insulated electric leads connected to the ends of said resistance unit and extending freely to a significant distance away from said grid.

References Cited in the file of this patent

UNITED STATES PATENTS

1,349,136	Lillard	Aug. 10, 1920
2,406,884	Mann et al.	Sept. 3, 1946
2,478,808	Deal	Aug. 9, 1949
2,866,066	Neely	Dec. 23, 1958
2,868,946	Stephenson	Jan. 13, 1959
2,943,289	Colten et al.	June 28, 1960
2,961,524	Newman	Nov. 22, 1960
2,997,568	Leipold et al.	Aug. 22, 1961
3,069,522	Jamison	Dec. 18, 1962