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(54) **Doormat**

(57) A doormat or floor mat comprises a steel wire frame (10), a series of rubber or plastics separators (12) each extending between two opposite parallel sides (10A) of the frame (10), the two sides (10A) of the frame extending respectively through two end holes (12A) of each separator (12), a series of wires (14) each extending parallel to the two sides (10A) of the frame (10) through relatively small holes (12C) in the separators (12), a series of spacer tubes (16) placed on each said wire (14), with one such spacer tube (16) in between

each adjacent pair of separators (12), to space the separators (12) apart from each other, and a series of twisted-in fibre rods (18) each rotatably extending, parallel to the two sides (10A) of the frame (10), through relatively large holes (12B) in the separators (12), in between the wires (14) and spacer tubes (16).

The mat is reversible, the underside being identical to the topside whichever way up the mat is placed.

The separators (12) are formed with ridges or studs (12D).

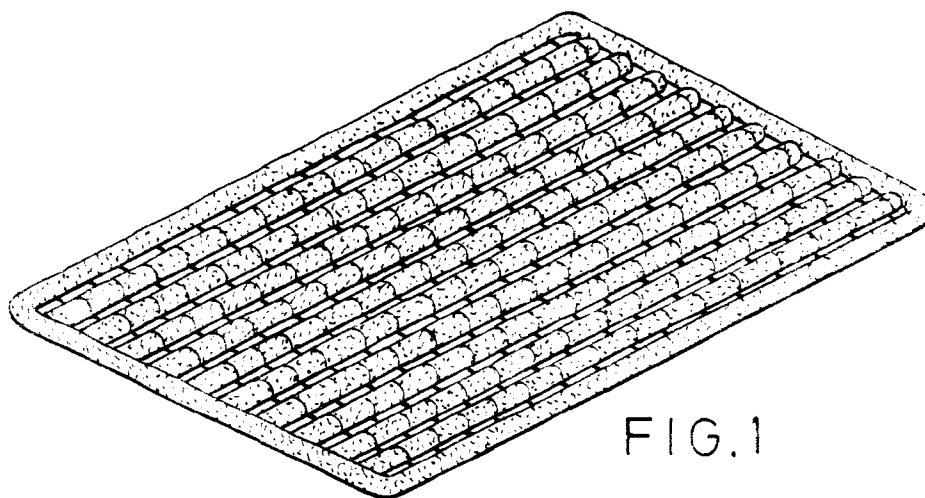


FIG.1

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Description

Field of the invention

This invention relates to rotary fibre rod doormats with rubber and/or plastic components.

Prior Art

Conventional doormats are manufactured with fibre and rubber or plastic materials for use at the entrances, exits and doorways and openings of all types of buildings and the designs and techniques used so far have served the purpose only partly, creating certain disadvantages as listed below.

Dirt, mud and other substances such as snow are not completely removed from the boot or shoe, as the wiped dirt accumulates on the brush fibres. since these are placed and fixed on a flat horizontal plane generally parallel to the floor on which the doormat is placed. Therefore such known doormats with such profiles are not efficient and require periodical cleaning by for example lifting, shaking or vibrating. These vigorous actions are not only tedious but reduce the life time of the mat drastically.

These conventional type doormats, made of coconut fibre and the like and having rubber or plastic components have the fibre and the like materials in a tight configuration on a flat surface, thereby preventing drying by rapid evaporation of any moisture acquired with dirt during rains or snow.

Doormats with steel wires incorporating fibres have the distinct disadvantage of getting corroded due to frequent presence of moisture in addition to the above mentioned disadvantages, since the brush fibre are stationarily fixed to the steel wire frame without allowing any movement.

Summary of the invention

The object of the alleged invention is aimed at overcoming most of the disadvantages of the prior art door and floor mats and also using as far as possible ecologically friendly re-cyclable materials such as natural fibres and rubber and plastics.

The invention also permits introduction of various cosmetic effects, designs and patterns to the doormat by using different colours types available in the said materials. The invention provides for rotary movement of circular brush rods made by twisting galvanised wire with inserted brush fibres. The rotation of the said brush rods enhances the life of the mat.

Hence the entire circular surface is used and the dirt and dust fall under the mat while providing air circulation for rapid evaporation of the frequently present moisture.

The manufacture of this unique doormat employs a novel way of inserting the rotary circular brush fibre rods

made with galvanised steel wire. A special apparatus has been invented to enable achieve the object of the invention.

The invention provides a door or floor mat which is made of a metal wire frame using a rubber/plastic grid and brush fibre rods that are twisted in wire with coir fibre, polypropylene fibre, PVC fibre/dyed coir fibre, palmyrah fibre etc, to be used as a cleaning device near any entrance or exit of any household or industrial establishment to remove dust, mud, snow or other dirt.

Here the cleaning action is provided by circular self-rotating coir fibre rods as well as fibre/plastic separators having ridges or studs and plastic tubes covering the metal grid.

Preferably, the ridges and studs on the thin rubber/plastic separators on both top and bottom side of the thin walls are designed symmetrically about a longitudinal axis along the centres of the holes of the said injection moulded separators to remove, loosen and disintegrate the hardened dirt or snow etc and to make it fall through spaces provided in between the rotatably inserted twisted in fibre rods. The said ridges and studs enhance the strength of the separators thereby increasing the strength of the finished floor mat/doormat.

A preferred embodiment of the invention essentially consists of two basic parts:

1. A frame - this is made out of a unique grid comprising rubber/plastic separators having ridges or studs and holes to accommodate twisted in fibre rods in a self-rotating manner and rubber/plastic tubes with G.I Wire/Plastic hooks locked together to a pre-determined pattern.

2. Twisted in Fibre rods - These are made by twisting metal wire with brush fibre entangled in the twisting wire using a specially designed machine. These can be made to required lengths and densities of fibre using this machine to obtain cylindrical fibre rods of required diameters. Different types of fibre and various coloured fibres can be used.

The said twisted in fibre rods are placed at 90 degrees to the frame and hence the brushing action is more effective compared to the other wire coiled door/floormats. This means that the brushing action on the shoe or boot is generally perpendicular to the cleaning brush fibre rods and in line with the ridges and/or studs of the said rubber/plastic strips to break or loosen off any hardened dirt, mud or snow.

Since these brush fibre rods are self-rotating they have an increased durability by ensuring uniform wastage on all around the circumferential surface. This rotary action incorporated with the space provided in between the adjacent rotary circular brush fibre rods allows the dirt or dust to fall onto the ground under the cleaning mat without sticking in the cleaning brush fibre.

The spaced design, the radial spreading of the fibre

with optimum density combined with the rotary action of the brush fibre rods enables quick evaporation of any moisture and thereby drying the floor/doormat in a short time.

Due to the nature of the rubber/plastic and fibre materials used, the said mat could be produced in a variety of colours and patterns to give a matching effect to the place of its use and to suit any individual user's taste.

Since the alleged door/floor mat may be made with identical features and properties on both top and bottom sides, both these sides can be used in turns and this feature enhances the durability and the lifetime of the said floor/doormat.

Brief Description of Drawings

FIG. 1 is an isometric view of a floormat/doormat embodying the invention;

FIG. 2 is a plan view of the floormat/doormat embodying the invention of FIG. 1;

FIG. 3 is a front elevation of the floormat/doormat embodying the invention of FIG. 1;

FIG. 4 is a side elevation of the floormat/doormat embodying the invention of FIG. 1;

FIG. 5 shows an open, or U-shape, of metal frame of a floormat/doormat embodying the invention;

FIG. 6 shows a rectangular metal frame of a floormat/doormat embodying the invention;

FIG. 7 is a cross-section through a rubber/plastics separator in a floormat/doormat embodying the invention;

FIG. 8 shows an intermediate stage in the construction of a floormat/doormat embodying the invention;

FIG. 9 shows a later stage in the construction of a floormat/doormat embodying the invention;

FIG. 10 is an enlarged view of part of FIG. 8;

FIG. 11 is a sectional view corresponding to FIG. 10;

FIG. 12 is a side elevation of a special machine for assembling a floormat/doormat embodying the invention;

FIG. 13 is a plan view of the machine as seen in FIG. 12;

FIG. 14 is a similar view of the machine as shown in FIG. 12, but at a different stage in production; and

FIG. 15 is a plan view of the machine as shown in FIG. 14.

Detailed description of preferred embodiments with reference to the drawings

The following description of the preferred embodiments does not in any way limit the scope of this invention to these embodiments and the following description of these embodiments is only by way of example of the many embodiments of the invention that are covered by the scope of the claims.

Components of the floor/doormat are unique and novel and therefore are made systematically with spe-

cial purpose tools and assembled with custom designed machines and apparatus.

Frame 10

To make the frame 10, see FIGS. 5 and 6, "GI" (galvanised iron) wire is straightened by a wire straightening machine and then bent by using a jig, herein called "Frame making Jig", into an open rectangular shape, i.e. a U-shape, as shown in FIG. 5.

The GI wire used to make the said frame is around 4 mm in diameter conforming to ASTM A 641 Class 3 heavily Galvanised. The zinc coating on this wire is 290 grams per square metre (gms/m²) and the tensile strength is in the range of 41-55 kilograms per square millimetre (kgs/ mm²).

Generally the frame size is limited to 550 mm - 345 mm with the possibility of manufacture of larger or smaller versions as per the requirement.

Rubber/Plastic Separators (strips) 12

A rubber/plastics separator strip 12 is shown in FIG. 7. It is relatively thin (i.e. only approximately 4.5 mm thick) and is made by injection moulding process and has different size diameter holes as follows:-

a) two holes 12 A, to receive the outer wire arms 10A (FIG. 5) of the frame 10, at the extreme ends of the separator 12;

b) a series of equi-spaced, larger holes 12B, to receive twisted in fibre rods 18;

c) a series of small holes 12C, i.e. about 2.0-2.24 mm diameter, in between the larger holes 12B, to receive wires 14, around which are plastic spacer tubes 16, holding the separators 12 at equal intervals.

Ridges and/or studs 12D on these separators 12 enhance the strength of the thin separators 12, thereby increasing the durability of the floor mat/doormat of the invention.

Referring to FIG. 5, the distal ends 10C of arms 10A of the U-shape wire frame 10, at the open end 10D of the U-shaped frame as shown, are inserted through the holes 12A of the separators 12, so that the separators 12 are transverse to the arms 10A and extend between them as shown in FIG. 5.

Then, as shown in FIG. 6, the distal ends 10C are folded over, so as to overlap, and are welded together by means of a spot-welding or gas-welding machine (not shown).

Then, as shown in FIGS. 8, 9 and 11, the wires 14 are inserted, parallel to the frame arms 10A, through the small holes 12C of the separators 12, an individual spacer tube 16 being fitted onto each individual wire 14 in

between each respective pair of successive separators 12 until, as shown in FIG. 10, with (for example) seven wires 14 and (again, for example) sixteen spaces between successive pairs of separators 12, there are $7 \times 16 = 112$ spacer tubes 16 keeping the separators 12 properly spaced apart. The end 10D of the frame 10 of the mat thus being manufactured is placed facing a fibre rod-inserting machine 20 (FIGS. 12-15) which is specially designed for the assembly of the circular rotary brush fibre rods 18 (FIG. 13) in the GI Wire grid frame 10, the latter being pre-assembled as described above with the rubber or plastic separators 12 and plastic tubes 16.

Twisted-in-Fibre Rod-Inserting Machine 20 and Method of Inserting Rods 18

Referring to FIGS. 12-15, the machine 20 comprises a metal frame 20A with sturdy legs 20B. The frame 20A forms a rectangular machine bed 20A having a flat surface with a clean smooth finish and having a length of more than double the length of the floor mat to be manufactured. On this machine bed 20A, at one shorter end of the rectangular surface, a solid block 20C is fitted at the centre. the block 20C has an internally threaded hole through which a screw shaft 20D can be screwed inwards or outwards parallel to the surface, by rotating the screw shaft 20D either manually by means of a handle 20E, or by powered means (not shown).

One end of the screw shaft 20D, near the end of this machine bed table 20A, is fitted with the driving means, e.g. handle 20E, and the opposite end of the shaft 20D is connected, by means of a bracket 20F, to a flat bar 20G. The bar 20G extends perpendicular to the shaft 20D and is movable in the direction of the axis of the shaft 20D. The outer ends of the bar 20G are slidably guided by means of two fixed guides 20H extending parallel to the shaft 20D. The bar 20G is fitted with a series of hooks (not shown) for attachment to proximal ends of 6mm draw wires 20J, there being one hook and one associated draw wire 20J for each individual twisted in fibre rod 18.

The Method of Inserting the Twisted in Fibre Rods 18

The partly assembled floor mat frame 10, without the twisted in fibre rods 18, that is to say, in the partly finished condition as shown in FIG. 9, is placed flat on the machine bed surface adjacent to the flat bar 20G, away from the screw shaft area. with the shorter side 10D of the frame 10 parallel to the flat bar 20G of the machine 20.

The hooks on the flat bar 20G are connected to the proximal ends of the 6 mm metal draw wires 20J, which have been fed through the holes 12B in the separators 12.

Now the distal ends of the 6 mm draw wires 20J are each connected to a respective proximal end of a twist-

ed in fibre rod 18. the latter extending parallel to the shaft 20D. The proximal ends of the rods 18 are adjacent to the shorter end of the frame 10.

The driving means, either manual (e.g. handle 20E) or powered, is activated to rotate the screw shaft 20D, so that the said shaft 20D moves outwards, through the block 20C. from the frame 10, thereby inserting the twisted in fibre rods 18 through the holes 12B (FIG. 7) of the separators 12 as shown in FIG. 15.

5) The connections of the said fibre rods 18 to the 6 mm draw wires 20J are disengaged.

6) Finally a single long twisted in brush fibre rod is attached around the rectangular frame 10 after fitting the detached shorter side of the frame to obtain the said doormat which has identical appearance and properties on both sides so that both bottom and top side could be used.

20 Claims

1. A doormat or floor mat, comprising a steel wire frame (10), a series of rubber or plastics separators (12) each extending between two opposite parallel sides (10A) of the frame (10), the two sides (10A) of the frame extending respectively through two end holes (12A) of each separator (12), a series of wires (14) each extending parallel to the two sides (10A) of the frame (10) through relatively small holes (12C) in the separators (12), a series of spacer tubes (16) placed on each said wire (14), with one such spacer tube (16) in between each adjacent pair of separators (12), to space the separators (12) apart from each other, and a series of twisted-in fibre rods (18) each rotatably extending parallel to the two sides (10A) of the frame (10), through relatively large holes (12B) in the separators (12), in between the wires (14) and spacer tubes (16).
2. A doormat or floor mat according to claim 1, wherein the mat is reversible, the underside being identical to the topside whichever way up the mat is placed.
3. A doormat or floor mat according to claim 1 or 2, wherein the separators (12) are formed with ridges or studs (12D).
4. A doormat/floor mat for indoor and/or outdoor use, comprising a steel wire frame (10) and a grid and plastic/rubber strips (12) and tubing (16) having twisted in brush fibre circular rods (18) rotatably placed equally spaced parallel to the grid and through symmetrically studded plastic/rubber strips (12) inserted to the frame (10) with holes (12B) fitted perpendicular to the steel grid and holding the said fibre rods (18) at desired spaces with the plastic tubes (16) around the steel wires (14) of the said grid so as to make the doormat having identical fea-

tures both on top and bottom sides.

5. A generally rectangular doormat/floor mat consisting of a steel wire frame (10) around with one shorter side detachable prior to assembly having thin string rubber/plastic strips (12) longer than the shorter side of the frame with two holes (12A) on either end to pass through the longer side outer steel wires (10A) of the frame and equally spaced holes (12C) to insert a steel wire grid parallel to the longer side having plastic tubing (16) over this grid wire (14) to fit in between the said strips (12) to place them equally spaced perpendicular to the longer side and the said strips (12) having further larger diameter holes (12B) in between the holes (12C) for the wired grid to accommodate rotatably circular twisted in brush fibre rods (18) made of Galvanised Iron wire twisted with brush fibre and these fibre rods (18) being inserted to the grid so assembled by specially invented mechanical apparatus and finally attaching a single long twisted in brush fibre rod around the rectangular frame after fitting the detached shorter side of the frame to obtain the said doormat which has identical appearance and properties on both sides so that both bottom and top side could be used. 5 10 15 20 25
6. A doormat/floor mat as claimed in Claim 4 where the component materials are re-cyclable and ecologically friendly. 30
7. A doormat/floor mat as claimed in Claim 4 or 5 where the component materials may be given colours or patterns or arrangements to give an enhanced cosmetic effect to the end product. 35
8. A doormat/floor mat as claimed in any one of claims 4 to 7, wherein the twisted in fibre rods are inserted with such precision to rotate only when substantial transverse force is applied by the user when in use for the purpose provided for. 40
9. A doormat/floor mat as claimed in any one of claims 4 to 8, wherein the rubber/plastic separators are thin strips having the unique design to have ridges or studs protruding out perpendicularly on the thin edge of the strips symmetrically about the longitudinal axis passing the centre of the holes therein to be in level with the upper/lower surface of the twisted in brush fibre rods to enable the hardened dirt and snow to be disintegrated and separated by its sharp edges to fall through the spaces provided in between the said rods and to give additional strength to the finished said mat. 45 50 55
10. A mechanical apparatus/machine to insert the twisted in fibre rods rotatably through the provided holes in the rubber/plastic inserts made by injection

moulding to manufacture the doormat/floor mat as claimed in any of the above claims having a manually or mechanically/electrically operated screw shaft fixedly movable by rotation of the said shaft parallel and transversely on a flat machine bed table surface of a size at least twice the size in length of the mat about a matching screw block fitted on one shorter end centre of the said table and having a flat bar with attachable/detachable means to connect the said twisted in fibre rods by one end and pull them to insert through the provided holes in the said separators when the screw shaft is rotated to move the said flat bar guided by guide bars fitted flat to the said machine bed surface so that when the means connecting the said twisted in fibre rods and the said flat bar are detached from the said rods to make available the mechanically twisted in fibre rods inserted fibre floor mat/doormat.

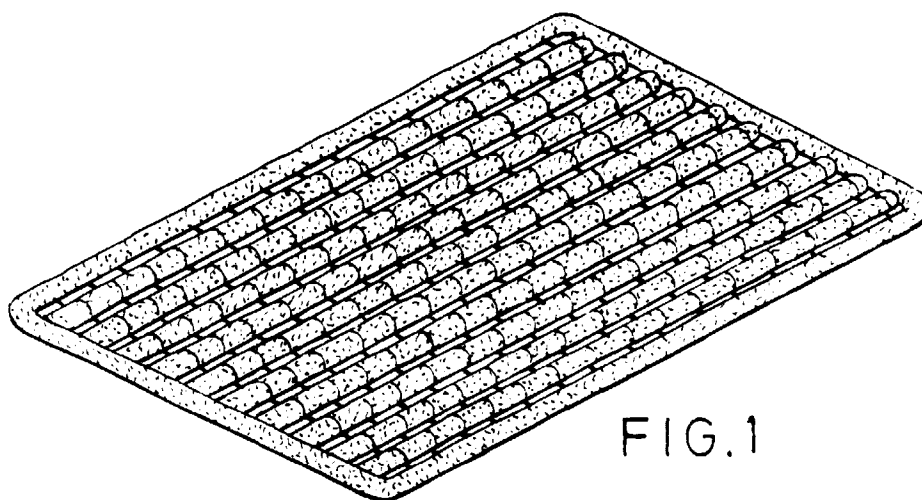


FIG. 1

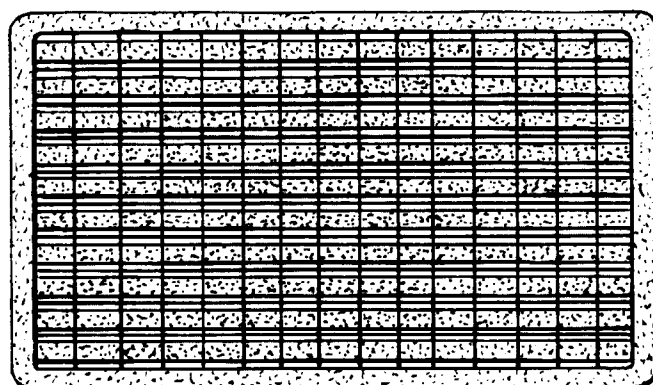


FIG. 2

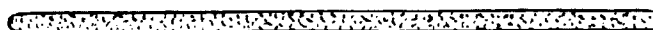


FIG. 3

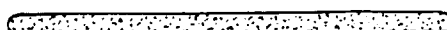


FIG. 4

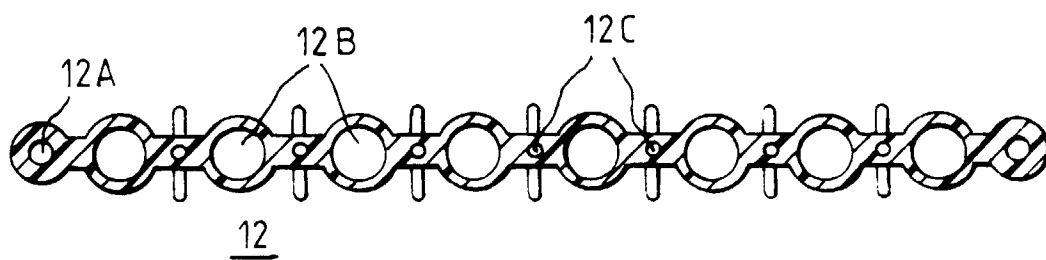


FIG. 7

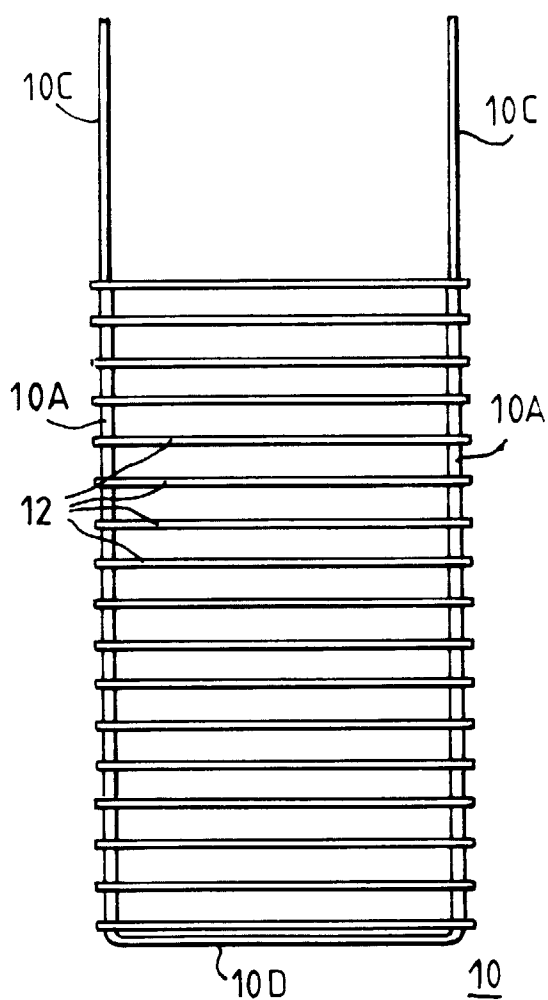


FIG. 5

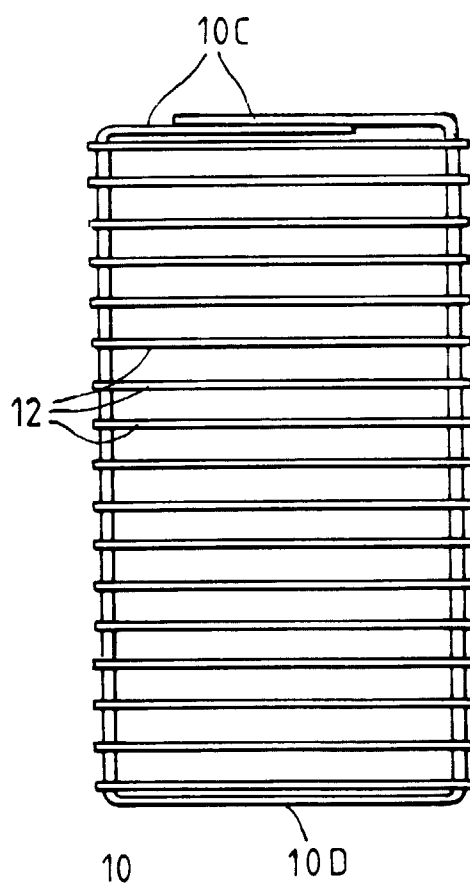
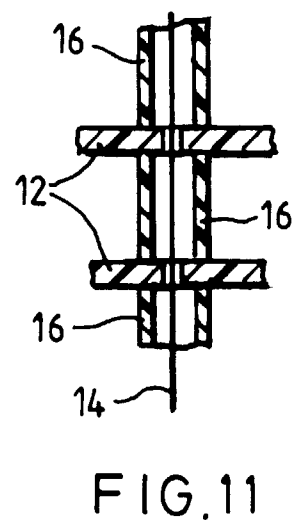
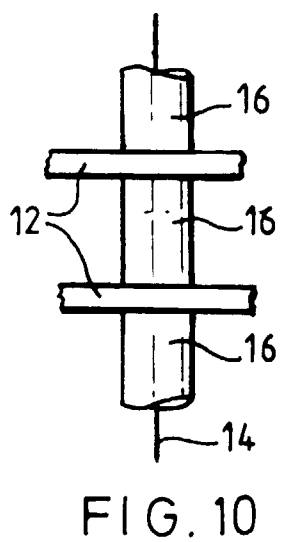
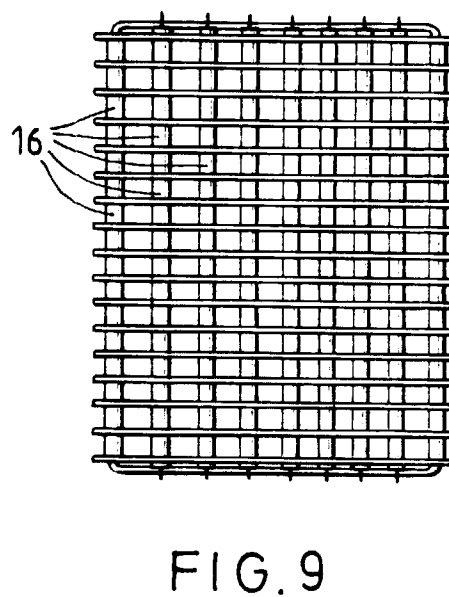
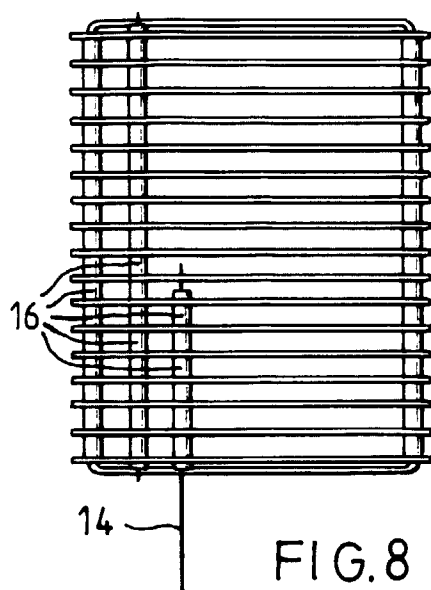


FIG. 6



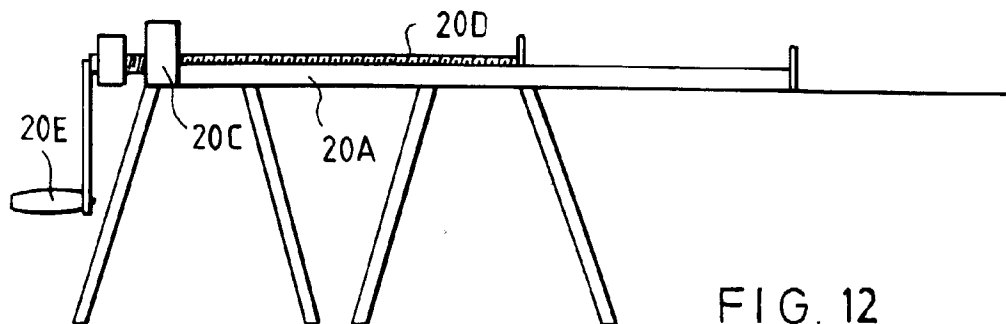


FIG. 12

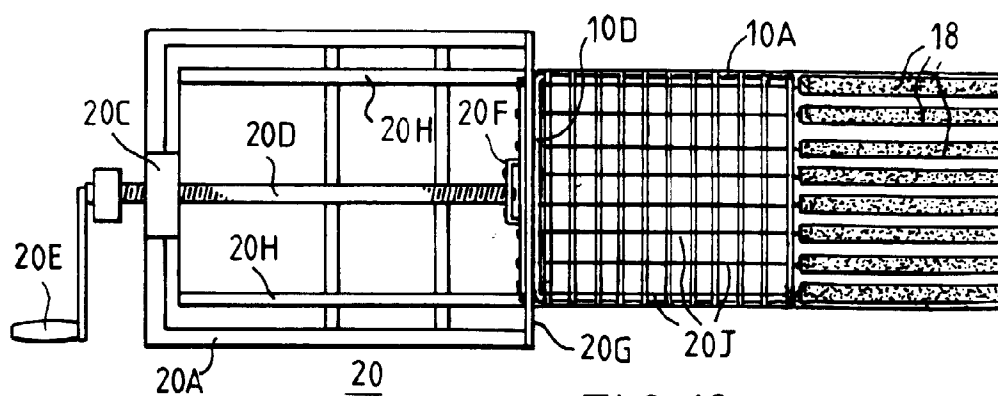


FIG. 13

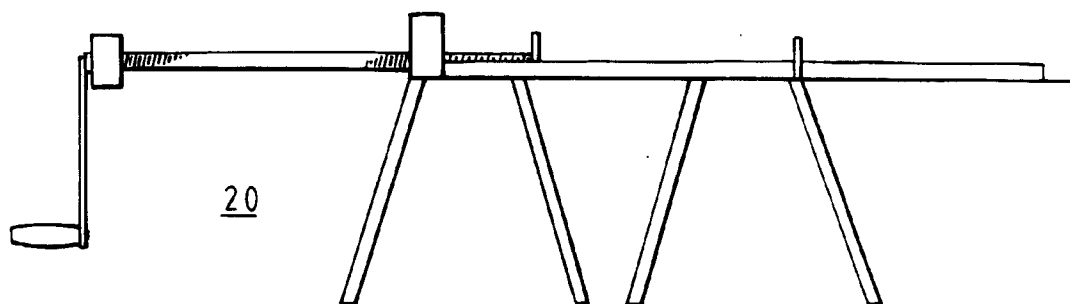


FIG. 14

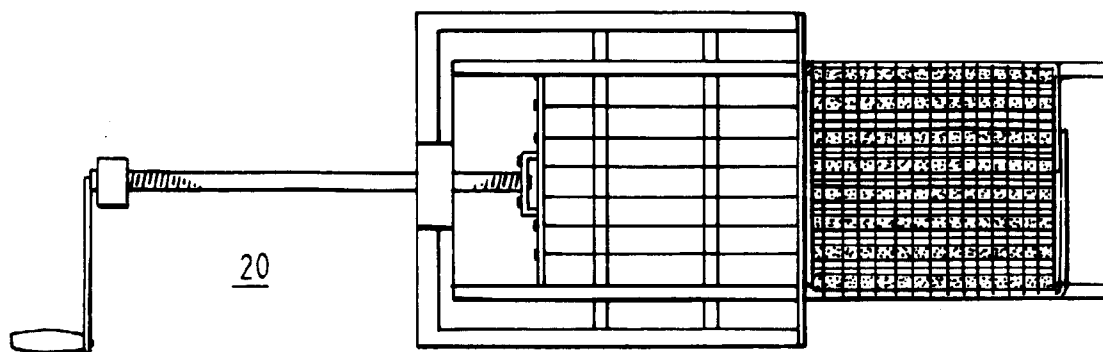


FIG. 15