Feb. 8, 1966 J. P. BREBNER 3,233,530

COMPACTION DEVICE

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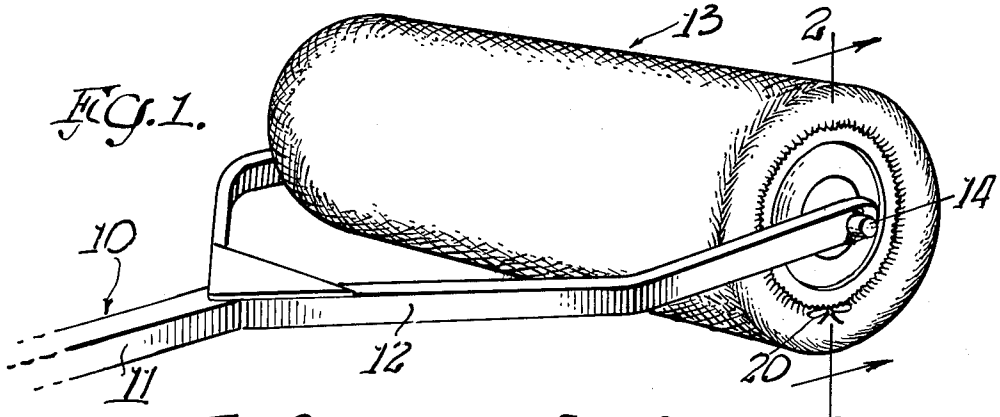


FIG. 1.

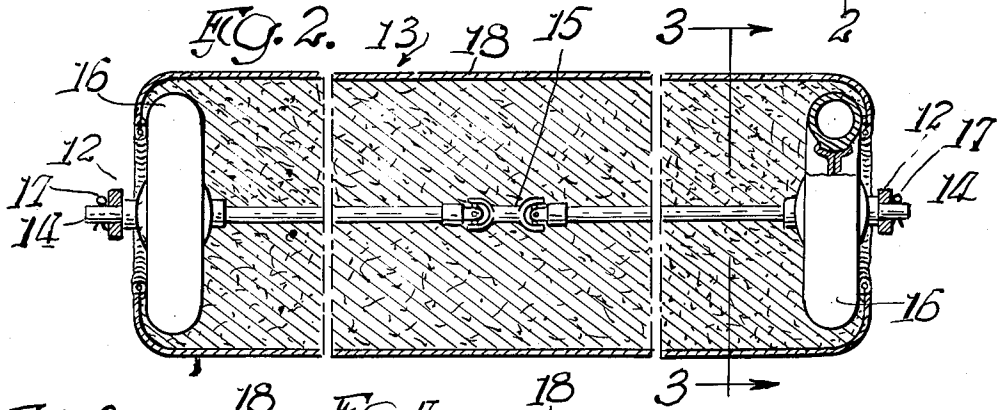


FIG. 2.

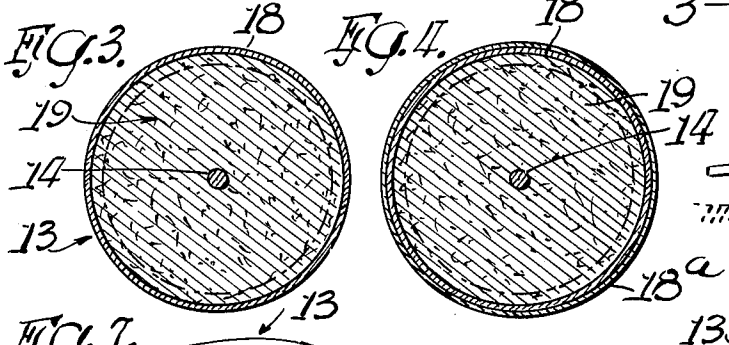


FIG. 3.

FIG. 4.



FIG. 5.

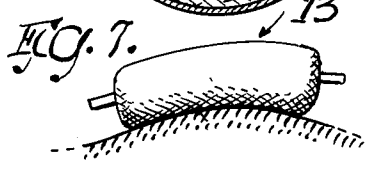


FIG. 7.

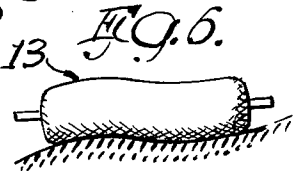


FIG. 6.

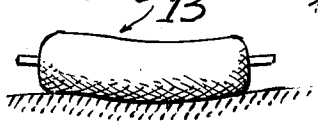


FIG. 9.

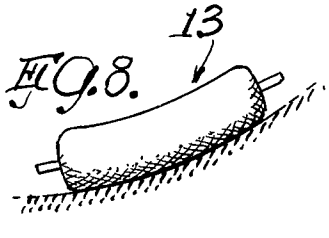


FIG. 8.

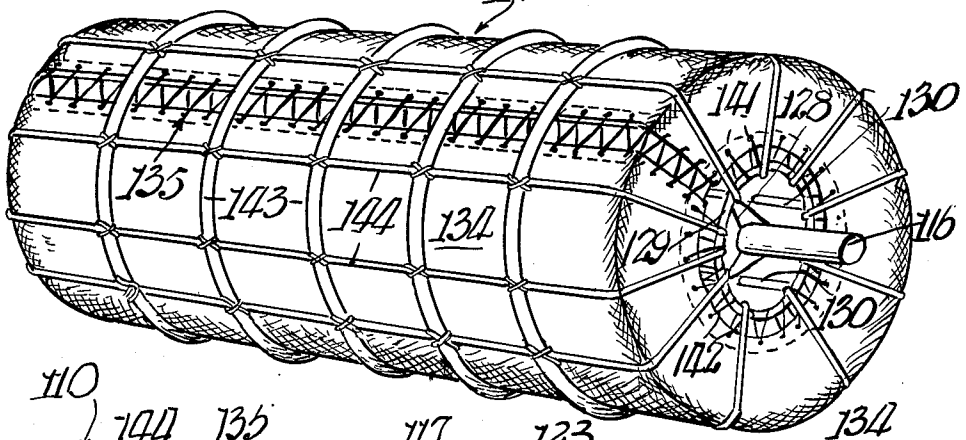
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FIG. 10.



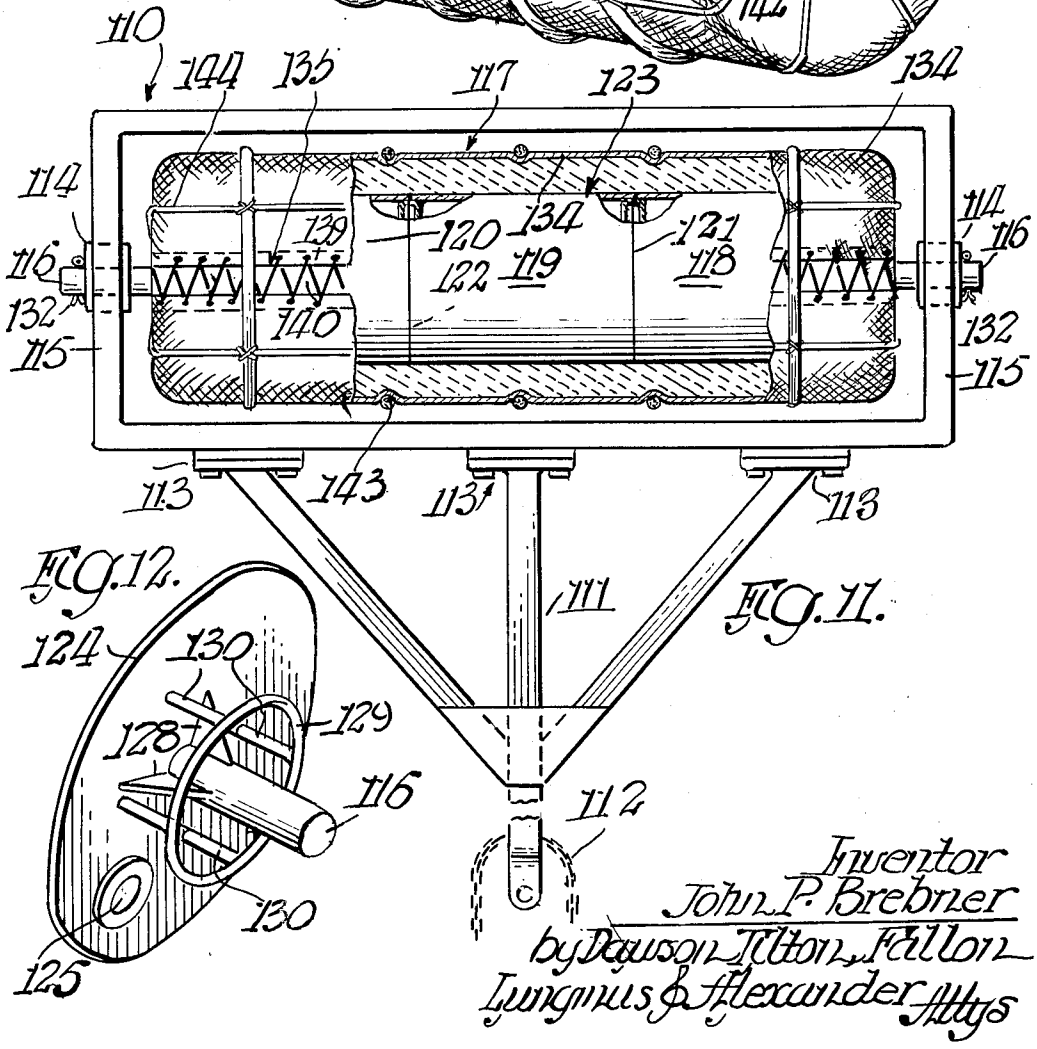


FIG. 12.

FIG. 11.

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Fig. 13.

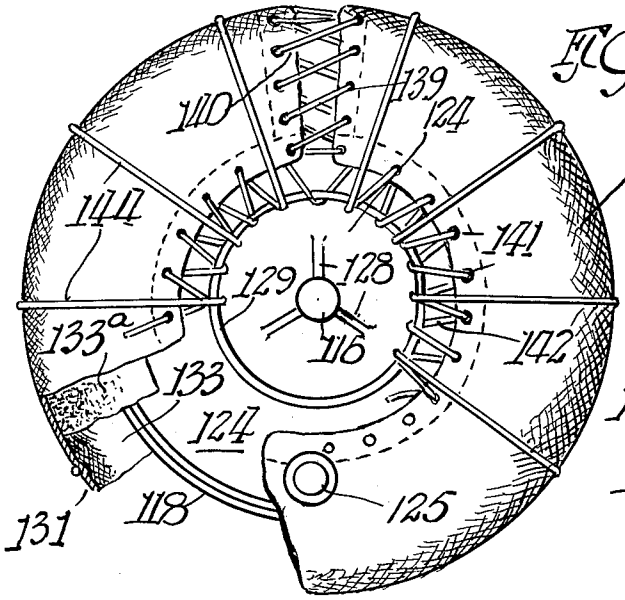


Fig. 14.

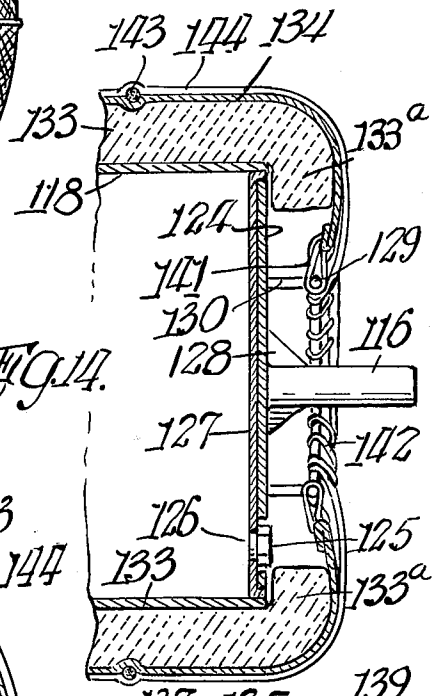


Fig. 15.

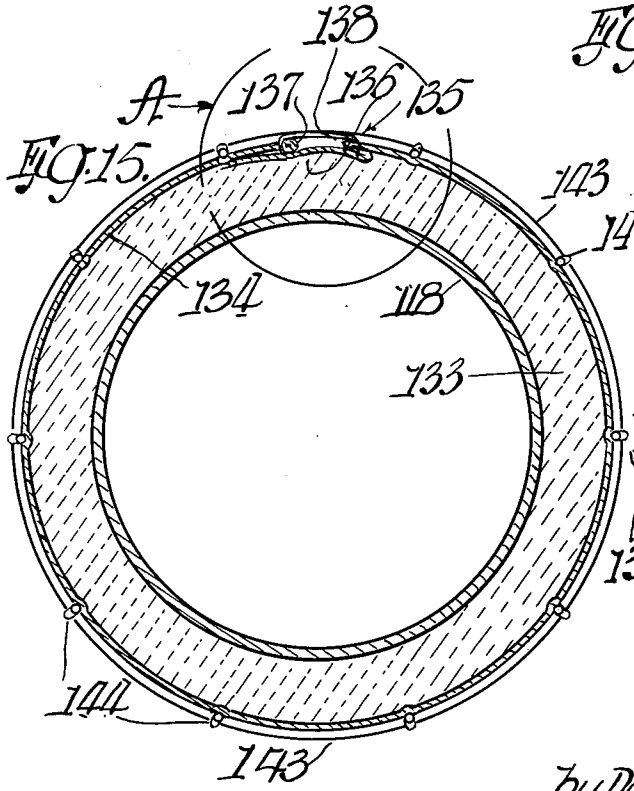
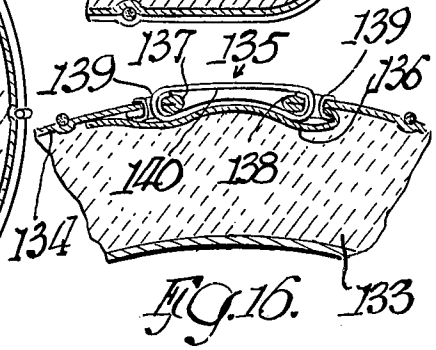


Fig. 16.



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COMPACTION DEVICE

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Filed Jan. 3, 1963, Ser. No. 249,973
3 Claims. (Cl. 94—50)

This application is a continuation-in-part of my copending application, Serial No. 149,759, filed November 2, 1961 and now abandoned.

This invention relates to a compaction device, and, more particularly, to a device particularly effective in compacting snow—as on ski slopes, and the like.

In compaction, it is desirable not only to increase the density of the material being subjected to a rolling action, but in many instances it is equally desirable to smooth out high points or areas. Both objectives were imperfectly achieved by prior expedients such as those employing large air-filled tires. Additionally, marking lines appeared on the snow, stemming from the lines of demarcation between adjacent tires or from the conventional transverse slats in other compaction devices.

It is, therefore, a general object of this invention to provide a novel compaction device and one which goes beyond the effectiveness characteristic of prior art devices.

Another object of the invention is to provide a novel compaction device, advantageously applied to snow, which is essentially self-cleaning and resistant to snow build-up because of a novel kneading action inherent in the compaction device.

Still another object of the invention is to provide a novel compaction device wherein the degree of compaction can be readily changed to accommodate the device to different conditions of operation.

Other objects and advantages of the invention will be seen in the details of construction and operation set down in this specification.

The invention is described in conjunction with an illustrative embodiment in the accompanying drawing, in which—

FIG. 1 is a fragmentary perspective view of the inventive device;

FIG. 2 is an enlarged sectional view such as would be seen along the sight line 2—2 as applied to FIG. 1;

FIG. 3 is a transverse sectional view such as would be seen along the sight line 3—3 of FIG. 2;

FIG. 4 is a view similar to FIG. 3 but which illustrates the provision of a supplemental replaceable wear sleeve on the device;

FIGS. 5–9 are fragmentary elevational views, on reduced scale, showing the device represented essentially schematically in different operating environments;

FIG. 10 is a perspective view of a modified form of the invention, showing the roller portions separate from the frame;

FIG. 11 is a top plan view, partially in section, of the modified form of the invention, the roller of which is seen in FIG. 10;

FIG. 12 is a fragmentary perspective end view of the end plate provided in the construction of FIGS. 10 and 11;

FIG. 13 is an enlarged end view, partially broken away, of the construction seen in FIGS. 10 and 11;

FIG. 14 is an enlarged fragmentary sectional view of an end portion of the roller seen in FIGS. 10, 11 and 13;

FIG. 15 is a transverse sectional view of the roller of FIGS. 10, 11, 13 and 14; and

FIG. 16 is a fragmentary sectional view of the portion of the roller encircled in FIG. 15 and designated by the symbol A.

In the illustration given, the numeral 10 designates

generally a frame suitable for attachment to a self-propelled vehicle. The frame 10 includes a drawbar 11 which may be equipped with a suitable hitch (not shown) for coupling to a complementary fitting on the rear of a tractor, or the like. Extending rearwardly (considering forwardly as the normal direction of movement of the device) are spaced-apart draft arms 12 which rotatably support a roller generally designated 13.

As shown, each arm 12 is apertured near its rear end for the receipt of an axle 14, and advantageously, the axle 14 may be equipped with a universal joint 15 at about its longitudinal center (see FIG. 2). Alternatively, the axle 14 may be omitted, employing stub axles fixed to the arms 12 on which the closures 16 may be rotatably mounted.

The axle 14 also supports a pair of wheels 16 which, in the illustration given, are fixed to the axle or shaft 14. The axle or shaft 14 is journaled within the arms 12 and maintained against longitudinal movement by means of cotter pins 17.

Fitted over the wheels 16 which serve essentially as end closures, is a flexible tubular sleeve 18. Optimally, the sleeve can be constructed of fabric-like materials, such as the synthetic polymers of nylon or dacron, or rubberized or plain canvas. The annular space within the casing or sleeve 18 and the axle 14 is filled with variable weight sponge-like bulk cellular materials, and suitable for this purpose is shredded or blanket form padding, synthetic rubber, straw, wood sawdust, or shavings. It follows that the degree of loading and particle size will determine the degree of compaction.

In certain instances, it may be advantageous to provide a replaceable supplemental sleeve, and this is designated by the numeral 18*a* in FIG. 4.

The operation of the device is illustrated in a number of different environments in FIGS. 5–9, where different contours of ground or snow are represented and seen to cause a corresponding distortion of the roller. Notwithstanding the distortion of the roller to accommodate itself to the general contour of the ground or snow, there is a sufficient resistance to deformation characteristic of the roller 13 which results in levelling localized small high spots.

It will be appreciated that a roller 13 constructed as specified herein is largely self-cleaning and resistant to snow build-up thereon due to the flexing or kneading action it necessarily undergoes as it rolls. Further, the roller is capable of absorbing irregularities without sharp and rapid deflection, as in a rigid roller, making it capable of more rapid compaction speeds without damage to the roller or hitch mechanism. Still further, a bag-type compaction roller may be partially or completely filled with various other weight bulk materials to achieve either lesser or greater compaction for a given job.

As indicated above, the roller 13 may have a replaceable casing 18 or 18*a*, as the case may be. This may be especially advantageous where the material compacted is abrasive in nature, since renewal of the wear surface is facilitated. In the illustration given, the fabric-like casing is essentially sausage-like in profile, the casing being equipped with constricted ends achievable through the use of drawstrings as at 20 (see FIG. 1). The constricted ends bear up against the end closures 16, and thus it will be apparent to those skilled in the art that an alternative arrangement includes journaling the axle 14 within the end closures 16 while having the axle 14 fixed within the load arms 12.

The low pressure pneumatic tires 16 are also advantageous in preventing pinching damage to the sleeve 18 when severe irregularities are encountered.

In snow, it is desirable to use a light roller to lightly press the snow into compact form. Additional weight is not often desirable, since too much weight causes the snow to be pushed ahead rather than rolled over for the desired results. If additional weight is required, the same is achievable through a modified form of the invention as seen in FIGS. 10 and 11, wherein the interior of the roller is equipped with ballast drums.

Referring now to the second and third sheets of the drawing, and first to FIG. 11, the numeral **110** designates generally a frame for attachment to a self-propelled vehicle through a detachable hitch as at **111**. The hitch **111** may be equipped with safety chains as at **112**. For detachably securing the hitch **111** to the frame **110**, a plurality of bolt equipped brackets **113** are provided. Analogous to the showings on the first sheet is the provision of bearings **114** on the end or arm portions **115** of the frame **110**. Rotatably supported within the bearings **114** are stub axles or shafts **116** (see particularly FIG. 12). The axles **116** are provided as part of a roller assembly generally designated **117**.

The roller assembly **117** in the illustration given in FIGS. 10–16 includes a plurality of thin-walled drums arranged coaxially, the drums being seen in the broken-away portion of FIG. 11 and being designated **118**, **119** and **120**. The drums **118** and **119** are welded together end-to-end along the rims as at **121**, while the drums **119** and **120** are welded along the rims as at **122** (still referring to FIG. 11). The elongated multi-drum core designated generally **123** in FIG. 11 and made up of drums **118–120** is relatively flexible and provides a desirable flexing action much as the universal joint **15** in the embodiment of FIGS. 1–9.

For mounting the elongated drum assembly **123** within the frame **110**, a pair of end plates **124** (see FIGS. 12 and 14) are provided. Each end plate **124** is suitably welded to the end of its associated drum (**118** in FIG. 14), and is equipped with an access opening **125** aligned with the bunghole **126** provided in the drum end wall **127**. The welded ends of the drums within the peripheral welds **121** and **122** may be in communication so as to permit filling the drum assembly **123** with a suitable ballast to increase weight, if desired.

The plate **124** (as seen in FIG. 12) carries the stub axle **116** which is reinforced by suitable gussets as at **128**. The drum **124** also carries a lacing ring **129** disposed essentially parallel to and spaced from the plate **124** by means of rods **130**. This ring **129** provides the means for lacing the ends of a cover **131** in the manner seen in FIG. 13.

To properly position the roller **117** within the frame **110**, each stub axle **116** may be equipped with a cotter pin **132** (seen only in FIG. 11).

Fitted over the drum assembly **123** and confining a foam-type filler **133** is a tubular sleeve **134**. In the illustration given, the sleeve **134** is longitudinally laced as at **135** and, overlying the seam necessarily developed, the casing **134** is equipped with a sealing flap as at **136** (see FIGS. 15 and 16). The confronting longitudinal edges **137** and **138** (see FIGS. 11 and 16) are equipped with grommets or eyelets **139**, through which a lacing **140** is threaded.

The ends of the casing **134** are equipped with circumferentially disposed eyelets as at **141** (see FIGS. 10 and 13), through which a lacing **142** is threaded for anchoring the casing ends to the lacing ring **129**.

Advantageous prevention of side-slip may be achieved through the use of rope belts **143** which extend circumferentially around the casing **134** at longitudinally spaced points on the roller **117**. The rope belts **143** may be stabilized in place by longitudinally-extending drawstrings **144** (see FIGS. 10, 13 and 15), which are anchored at each end to the lacing rings **129**.

In the operation of the embodiment of the invention seen in FIGS. 10–16, the drums **118–120** may be partially or completely filled with a ballast material to increase the weight as desired, the drums being capable of flexing intrinsically, thereby enabling the roller to conform sufficiently to hollows or humps in the terrain being compacted.

In this connection, it will be appreciated that other flexible tubular forms may be employed, such as metal mesh, sheetmetal tubes, lightweight steel pipes, etc.

As before, the casing or cover **134** is preferably constructed of a resilient fabric material so as to compressively confine the resilient material **133**. The lacings or drawstrings **140** and **142** may be elastic or non-elastic, and the casing **134** may be suitably tensioned to adjust roller firmness through selectively and variably compressing the filler material **133** to the degree of tension applied to the lacings **140** and **142**. Also, it is preferred to provide the fabric cover **134** of waterproof construction for the prevention of moisture passing into the foam padding. Still further, best results are obtained when the filler **133** extends around the corners of the drums **118** and **120** as at **133***a* (see FIG. 14), so as to protect the roller core from damage and the cover **134** from pinching damage when hard objects are encountered.

In comparison with the conventional roller used for snow compaction, the inventive roller conforms to hollows and humps, giving uniform and smooth compaction, the inventive roller not bouncing at high speed but staying in contact with a slope to absorb irregularities therein.

As a specific example of the invention, the light weight of the roller **117** can be appreciated from the fact that a 12 foot width weighs only 650 pounds so as to pull evenly even in deep snow. In this specific example, the cover **134** may be constructed of nylon fabric having a neoprene coating so as to be relatively unaffected by moisture, temperature, or oil, and if cut or punctured, can be quickly patched. The filler material **133** may take the form of polyurethane blanket material, which is relatively unaffected by moisture or temperature and cannot mold or rot. The lacings as at **140** and **142** are constructed of nylon, while the belts **143** are preferably constructed of manila rope. The belts **143** may take their described form, or that of square mesh (cargo net) construction without affecting their purpose or function.

While, in the foregoing specification, I have set down detailed descriptions of embodiments of the invention for the purpose of illustrating the same, many variations in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. A compaction device for grooming snow on ski slopes, comprising a frame adapted to be towed by a vehicle, said frame having two aligned, spaced-apart axle mounts, resilient and longitudinally flexible elongated cylinder means equipped with axially outwardly-extending axles in the ends thereof and journaled in said mounts, a cylindrical layer of resilient material about said cylinder means, a fabric-like cover overlying said layer, and a plurality of longitudinally spaced belt means about said cover and extending annularly thereabout to prevent roller side-slip on hills.

2. A compaction device for grooming snow on ski slopes, comprising a frame adapted to be towed by a vehicle, said frame having two aligned, spaced-apart axle mounts, a plurality of thin-walled metal drums arranged in end-to-end relation to provide a resilient and longitudinally flexible elongated cylinder, said cylinder being equipped with axially outwardly-extending axles in the ends thereof and journaled in said mounts, a cylindrical layer of resilient material about said cylinder means, a fabric-like cover overlying said layer, and a pluraltiy of

longitudinally-spaced, annularly extending belt means about said cover to prevent roller side-slip on hills.

3. A compaction device for grooming snow on ski slopes, comprising a frame adapted to be towed by a vehicle, said frame having two aligned, spaced-apart axle mounts, a plurality of thin-walled metal drums arranged in end-to-end relation and weldably united to provide a generally resilient and longitudinally flexible elongated cylinder, said cylinder being equipped with axially outwardly-extending axles in the ends thereof and journaled in said mounts, a cylindrical layer of resilient material about said cylinder, a flexible cover overlying said layer, and a plurality of longitudinally-spaced, annularly-extending ropes about said cover to prevent roller side-slip on hills.

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