APPARATUS

Apparatus for assisting in the installation and laying of carpets, fabrics or the like. The apparatus includes a carpet engaging head which houses an adjustable plunger having a plurality of teeth affixed thereto. The plunger, upon being depressed into the carpet, causes the teeth to project from the bottom a length compatible with the thickness of the carpet. An impacting means for thrusting the device forward for stretching the carpet is disclosed, and comprises a selectively retractable piston located within the body of the device and automatically releasable upon termination of a manual stroke. Adjustment means is provided in the body of the device for selectively varying the impacting force.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates in general to an apparatus for installing carpets, fabrics or the like, and, more particularly, to an apparatus for stretching carpets during installation whereby a flat, smooth surface is obtained.

Description of the prior art

Heretofore, the installation of carpet has required the installer to grip the carpet with his hands, a hook or other means at his disposal for the purpose of stretching it to a length sufficient to preclude bunching or accumulation of the fabric. When carpeting does not lie flat and smooth upon the floor to which it is attached, there exists a danger that people walking over the carpet will trip and fall, causing serious injury to themselves. For this reason, it is necessary to ensure that when a carpet is laid, it be smooth and that there be no bunching of the fabric or material. Also, as many carpets have a tendency to stretch or elongate after installation due to the resilient nature of the backing material, their ornamental appearance is greatly reduced if improperly fitted in a loose or lumpy manner.

For these reasons, it has been the practice among carpet installers to make sure that the carpet is tightly and smoothly fitted to the floor. For this purpose, the carpet is stretched by means of attaching a hook or other mechanism thereto and pulling upon it until the desired degree of tightness is achieved. Hooks, however, do not prove to be satisfactory since they easily pierce the carpet should too much force be applied. Also, the amount of physical energy needed to stretch a carpet in the required manner over a prolonged period is considerable and thus physically exhausting. Furthermore, in order to keep the carpet in the stretched position, the installer must continually hold on to it and then have an assistant tack or affix it to the floor.

Consequently, it has become the custom within the carpet installation industry to use stretchers having a plurality of forward and downwardly facing teeth which sink into the carpet as the stretcher is pushed forward. Such stretchers, however, fall short of their intended purpose since the teeth are of a fixed height and, while being suitable for a particular thickness or grade of carpet, are either too short or too long for many others thereby causing severe damage to the carpet. Still more recently, stretchers have been introduced whereby the carpet gripping teeth may be adjustably exposed by the installer for compatibility with the thickness of the carpet. This adjustment feature is accomplished by means of a threaded shaft which is coupled to the carpet gripping teeth such that, as the installer rotates the shaft, a greater or lesser extent of the teeth is exposed. While such an adjustment provides an improvement to the earlier devices, it still requires the installer to guess or estimate the correct amount of teeth exposure required.

Another very serious disadvantage even in the foregoing devices of the most recent art resides in the fact that once the teeth have been wedged into the carpet, the installer is required to physically force the stretcher forward so as to make the carpet taut. This is almost universally accomplished by requiring the installer to get on his hands and knees and swing one knee forward until it makes contact with the padded end of the stretcher opposite the carpet gripping teeth and thus manually "knee" the stretcher forward. As a result, it is quite common for carpet installers to injure their knees and legs in the performance of this operation and consequently "water on the knee" and other leg injuries have been regarded as a very common hazard of the profession.

SUMMARY OF THE INVENTION

The foregoing problems and difficulties inherent in the prior art have been overcome by the present invention which, in a preferred embodiment, includes both an automatically adjustable carpet gripping head and an operator-actuated impacting driver means contained within the body of the apparatus.

The carpet gripping head comprises an inverted cup-like housing having an aperture therethrough which is adapted to receive an adjustably positionable plunger stem. Carpet holding means in the form of short teeth are disposed over the cup opening such that they tend to initially engage the carpet independent of carpet gripping teeth. The carpet gripping teeth themselves are attached to the inventive adjustable plunger in a selected pattern and are longer than the carpet holding teeth. The plunger includes an exterior handle and a shank extending into the housing. The plunger shank has a plurality of ratchet gear sections on opposing sides thereof which engage pawl members attached to the interior of the housing such that when the plunger handle is pressed downwardly to advance or project the carpet gripping teeth into the carpet, the gear sections ratchet past the paws. While the paws permit such downward movement of the plunger, they prevent upward retraction of the plunger and its carpet gripping teeth until the paws are disengaged from the ratchet gear sections. This disengagement is accomplished by rotation of the inventive plunger shank. Registration stops are provided to limit rotation of the plunger shank to the pawl engagement and disengagement positions. Springs within the housing act to stabilize and guide the plunger with respect to the housing as it rests upon the carpet.

Another feature of the present invention resides in the provision of driver or impact means for providing forward thrust to the carpet gripping head and, thus, to the carpet itself and comprises a movably mounted piston disposed within a hollow chamber in the body of the device. The piston is urged forwardly toward the head by power means such as a compression spring. The piston has lanyard pins fixedly projecting from opposing sides thereof which extend outside the body via slotted apertures in the body wall of the chamber. A cap, disposed adjacent the spring end opposite the piston, threadedly engages the body and may be adjusted such that the compression of the spring is increased or decreased as desired. The spring is selec-
tively compressed by means of a handle-actuated linkage attached to the body whereby, as the handle is manually rotated in an arcuate downward direction, the linkage engages the pins and forcibly retracts the piston against the biasing means of the spring for compression thereof. Upon release, the piston is driven forward by the spring until it strikes the forward end of the chamber, i.e., the body wall defining the chamber end adjacent the head. Cam means are provided for effecting automatic release of the piston and spring upon termination of the manual downward stroke of the linkage. Preferably, the piston comprises relatively heavy mass whereby the forward driving thereof causes the piston to have sufficient inertial force for impact driving of the head and carpet while minimizing the compressive strength of the spring.

Therefore, it is an object of the present invention to provide a carpet or fabric stretcher having means provided for stretching the carpet independent of operator applied force.

Another object of the present invention is to provide a carpet stretching device having adjustable carpet engaging and gripping teeth. The amount of teeth exposure can be easily adjusted and secured for repeated use at a given exposure.

Another object of the present invention is to provide a carpet stretcher means whereby the magnitude of the stretching force can be selectively adjusted for compatibility with the carpet strength and other characteristics.

A further object of the present invention is to provide carpet stretching means which includes an operator actuated driving means which can be automatically reset after each driving stroke.

Still a further object of the present invention is to provide carpet stretching means wherein the carpet engaging teeth may be automatically retracted and reset.

Another object of the present invention is to provide a carpet stretching apparatus having plunger means which control the amount of carpet engaging teeth exposure and which can be automatically set for various carpet thicknesses and grades.

Another object of the present invention is to provide a carpet stretching apparatus having driver means for providing required thrust for stretching the carpet wherein said driver means comprises a spring biased plunger disposed within the apparatus body which is selectively controlled by the operator and retracted against the force of the spring by manual rotation of lever linkage.

The features of the present invention which are believed to be particularly novel and advantageous are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIGURE 1 is a perspective view of the novel carpet stretcher of the present invention;

FIGURE 2 is an enlarged elevational view, partly in section, of the head of the carpet stretcher taken along line 2—2 in FIGURE 1 and illustrating the plunger in an advanced position;

FIGURE 3 is a view similar in aspect to FIGURE 2 and illustrating the plunger in a retracted position;

FIGURE 4 is an enlarged elevational view, partly in section, of the head of the carpet stretcher taken along line 4—4 in FIGURE 1 and illustrating the plunger in an advanced position;

FIGURE 5 is a fragmentary sectional view of the plunger shank and paw members taken along line 5—5 in FIGURE 2;

FIGURE 6 is an enlarged sectional view of the body of the device of FIGURE 1 and illustrating the piston in the forward or impacting position;

**FIGURE 7 is a section taken along line 7—7 of FIGURE 6; and**

**FIGURE 8 is an enlarged fragmentary elevational view of the body portion of FIGURE 1 and illustrates the handle and actuated lever linkage with the piston in the retracted position.**

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring now to the drawings, and more particularly to FIGURE 1 thereof, a carpet stretching apparatus of the present invention is generally indicated at 10 and comprises a head 12 on the forward end of a body 14 which has a base 16 on its aft end. The head 12 has a flat or planar undersurface which permits it to be laid in a flat or flush manner upon the carpet. The body 14 is elevated relative to the head undersurface and consequently is not tangent to the carpet. The base 16 also has a flat undersurface coplanar with the undersurface of the head 12 so as to permit the apparatus 10 to rest securely upon the carpet (not shown) in a stable manner.

The base 16 either may be padded or may have a pillow (not shown) encapsulating a portion thereof so as to permit the user of the apparatus 10 to place his knee or hand on or behind it without discomfort from recoil, hardness, etc. A manually grippable handle 18 is rotatably mounted on the forward end of the body 14 by means of legs 22 and 24 and a suitable pivotable connector 26. Intermediately disposed between the handle 18 and the connector 26 are links 28 and 30 which are rotatably mounted on the legs 22 and 24, respectively, by means of a spring-loaded pivotable connector 32 which urges links 28 and 30 in a clockwise direction of rotation in the axis illustrated herein. Each of the links 28 and 30 has a cam surface 34 at its free end; it will be noted that the illustrated apparatus is symmetrical about a vertical plane through the longitudinal center of the apparatus and, accordingly, this description refers to pairs of some corresponding elements although only one such element is shown.

The body 14 has a parallel pair of longitudinally slotted apertures 36 disposed therethrough which are suitable for receiving and guiding pins 38, and has a pair of release cam projections 40, all of which will be described more fully hereafter.

Referring now more particularly to FIGURES 2-5, the head 12 is seen as being of an inverted cup-like configuration and has disposed across its mouth a plurality of carpet biasing pads 42. Each of the holding pads 42 is unitarily provided with a plurality of short teeth 44 which slant downwardly and forwardly for initial engagement with the uppermost region of the carpet. The pads 42 are flexibly secured to the head 12 as by means of a plurality of conventional machine screw fasteners 46.

A plunger, indicated generally at 48, includes an anterior handle 50 integrally provided with a plunger shank 52 which passes freely through an aperture 54 in the head 12 and is rotatably secured to a plunger base 56 by means of a fastener 58 rotatably disposed through an aperture 60 in the base 56. Thus, the handle 50 and the shank 52 may be rotated about a vertical axis without rotation of the base 56 or the whole plunger 48 may be moved unitarily vertically relative to the remainder of the head 12.

The plunger shank 52 has a pair of ratchet gear surfaces 62 and 64 disposed on opposite sides thereof. Intermediate the ratchet surfaces 62 and 64 are a pair of smooth plunger shank surfaces 66 and 68. A stud 70 projects radially from the shank 52 such that rotation of the handle 50 and the shank 52 is limited by abutment of the stud 70 against either of stops 72 and 74 which project upwardly from base 56 and are acutely spaced about 90° from each other about the shank 52. Paws 76 and 78 are attached to the top undersurface of the head 12 as by means of fasteners 80 and are adapted to engage the
ratchet gear surfaces 62 and 64, respectively. The pawls 76 and 78 are not of sufficient length to touch or engage the smooth surfaces 66 and 68 of the shank 52. Thus, the plunger 48 may be freely moved in an upward or downward direction when the pawls 76 and 78 are disengaged from the ratchet surfaces 62 and 64 and are adjacent the smooth surfaces 66 and 68, and may be ratched in a downward direction when so engaged with the pawls 76 and 78.

The base 56 of the plunger 48 has a plurality of carpet gripping teeth 82 fixedly mounted thereon. The teeth 82 are made of a material desired horizontal attitude. Although the body portion 14 and the head 12 may be integral with each other, it will be noted that the body 14 is shown as being externally threaded at its forward end 92 for threaded engagement with an internally threaded flange 94 of the head 12 for ease of assembly and disassembly.

Referring now more particularly to FIGURES 6–8, the body 14 is seen to have a longitudinal cylindrical chamber 96 defined by a cylindrical body wall 98. The wall 98 has an internally threaded section 100 adjacent the base 16. The forward end of the chamber 96 is closed by a solid body wall 102 which has a threaded axial aperture 104 centrally located therein. A resilient spacer 106 having a central hole 108 is disposed adjacent the end wall 102. An adjustment nut 110 has an axial hole 112 and is externally threaded for threadably adjustable engagement with body wall section 100. The adjustment nut 110 has a knurled knob portion 114 which is disposed exterior to the chamber 96 in a grooved section 116 of the base 16 for manually selective operation. Opposite the knob portion 114 of the adjustment nut 110 is a cup-like cavity 118 which defines the end of the chamber 96. A guide rod 120 is axially positioned throughout the chamber 96 and has a threaded end 122 which threadably engages the threaded aperture 104 in the forward end wall 102. The guide rod 120 has a slender aft end 124 for purposes of screwdriver assembly. Intermediately positioned between the spacer 106 and the adjustment nut 110 is a piston 126 with an axial hole 128 for slidably receiving the rod 120 there-through. A compression spring 130 is located with its forward end abutting against the piston 126 and its aft end nested in the cup-like cavity 118 of the adjustment nut 110 for abutment against the nut 110. The characteristics of the spring preferably are such that when the piston 126 is in the forward position, the spring 130 is still partially compressed and thereby continues to force or urge the piston 126 against the spacer 106. Pins 38 project laterally from the piston 126.

The operation of the apparatus may be described in the following manner with reference to the drawings. The head 12 and the base 16 are placed upon the carpet to be stretched. Since each carpet varies in thickness and in texture, it is desirable that the exposure of the adjustable teeth 82 which grip the carpet be compatible with the thickness thereof. Upon being placed on the carpet, the plunger handle 50 is depressed by the operator until the reaction forces exerted by the carpet and the floor are enough to restrict its further movement. In this manner, the extent of exposed projection of the teeth 82 is automatically determined and adjustment need never again be made. For the same carpet, when the plunger handle 50 is depressed, the plunger shank's gear teeth 62 and 64 ratchet past the pawls 76 and 78. Clearly, pawls 76 and 78 engage teeth 62 and 64 to prevent upward retracting movement of the plunger 48. However, when the plunger handle 50 is rotated about 90°, the pawls 76 and 78 become disengaged from the gear teeth 62 and 64, respectively, of the shank 52, and the plunger 48 may then be retracted by simple lifting motion.

Returning now to the condition wherein the desired projection of teeth 82 has been achieved, the operator may now place his knee or hand upon or against the base 16 for added directional stability. The handle 18 is raised manually in a counterclockwise movement to retract the links 28 and 30, assisted by spring-loaded connector 32, to a forward position whereby the notched cam ends 34 engage the pins 38. Upon applying downward (clockwise) force to the handle 18, the links 28 and 30 cause the pins 38 to be forced in a backward direction along the slots 36 and, via the piston 126, to compress the spring 130. As the pins 38 approach the rearward terminus of the slots 36, the rounded upper portion 34a of cam ends 34 contact upwardly curved cam surfaces 40a of cam projections 40 and ride upwardly thereupon, thereby raising cam ends 34 up and out of engagement with the piston pins 38 for release thereof.

Immediately upon such release, the spring 130 drives the piston 126 forwardly to impact against the chamber's end wall 102 through the spacer 106 and thus to thrust the body 14 and its attached head 12 in the forward direction. In this manner, a forward thrusting movement is provided to the apparatus by engaging the teeth 82 and, to some extent, teeth 44 to push, force or stretch the carpet forwardly. Preferably, the piston 126 is of relatively great weight which, together with its accelerating velocity, generates very high momentum upon impact. The force with which the piston 126 makes impact is controlled in part by the position of the adjustment nut 110.

After the piston 126 has been thrust forward by the spring 130, the handle 18 may be moved again in a counterclockwise movement such that the links 28 and 30 are moved in a clockwise manner with their undersurfaces 28a sliding on the pins 38, until their cam ends 34 snap into resting engagement with the pins 38. In this manner, the teeth 82 which engage the carpet are repetitively thrust forward until the carpet is as taut as desired.

In the foregoing manner, a carpet of any determined thickness may be laid to any tautness desired without fear of tearing or damaging it. When laying various thicknesses of carpet, the operator need only rotate the head 50 to disengage the pawls 76 and 78 and, upon retraction, engage the pawls 76 and 78 with the teeth 62 and 64. The ease of engagement and disengagement is enhanced by means of the stops 72 and 74, respectively. Once the pawls 76 and 78 have been reengaged with the teeth 62 and 64, the operator need only press the plunger 48 to the new position. If carpets of differing strength are being laid, the adjustment nut 110 may be manually rotated to a more forward or rearward position for modifying the maximum compression force of the spring 130 and even the distance of travel for the piston 126.

By the foregoing invention, a novel stretcher having an automatically adjustable head compatible with any grade or thickness of carpeting can be utilized and permits any gueswork on the part of the installer which could result in carpet damage. The unique use of a driver means in combination with the stretcher not only affords greater ease of carpet installation but also virtually eliminates the danger of physical injury to the installer.

While a particular embodiment of the present invention has been shown and described, it will be obvious to
those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. In a carpet stretcher having a body member with a carpet engaging head fixed to a forward end of the body member, a plurality of short carpet-holding teeth fixedly depending from the head, and adjustment means for vertically moving a plurality of relatively long carpet-engaging teeth relative to the head, such adjustment means including a plunger mounted in said head and having a vertical shank portion fixedly provided with a manually operable handle exterior to to the head on the upper end of the shank and rotatably provided on the lower end with a plate from which such carpet-engaging teeth depend, the improvement in such adjustment means comprising: said head receiving said shank therefrom in vertically reciprocable relationship; ratchet means intercoupling said shank portion and said head whereby said plunger is manually vertically depressible via said handle relative to said head to a desired relative position and ratchedly retained therein.

2. The invention defined in claim 1 wherein: said ratchet means includes release means operable by rotation of said shank via said handle for releasing such ratchet retention whereby said plunger is vertically upwardly retractable.

3. The invention defined in claim 1 wherein said ratchet means comprises: a pair of pawls secured to said head and in spaced opposition to each other; and a pair of ratchet gear surfaces integrally projecting laterally from said shank on opposite sides thereof for respective engagement with said pawls.

4. The invention defined in claim 3 wherein: said shank is provided with a pair of opposing smooth surfaces intermediate said ratchet gear surfaces whereby manual rotation of said shank via said handle causes disposition of said smooth surfaces adjacent said pawls for release of ratchet engagement of said pawls with said shank.

5. The invention defined in claim 4 wherein: said shank is provided with a stud radially projecting therefrom; and said plate is provided with a pair of vertically projecting stop members in 90° arcuately spaced relationship to each other and rotationally obstructing relationship to said stud whereby manual rotation of said shank via said handle is automatically limited by said stop members at registered positions corresponding to such ratchet engagement and release positions.

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