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(54) **NATURAL TAPERED HOUSE LOG MILLING PROCESS**

FRÄSVERFAHREN ZUR HERSTELLUNG VON NATÜRLICHEN, VERJÜNGENDEN BAUMSTÄMMEN FÜR BLOCKHÄUSER

PROCEDE D'USINAGE DE BILLES NATURELLEMENT CONIQUES POUR CONSTRUCTION D'HABITATIONS

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(56) References cited:
BE-A- 548 733
CA-A- 918 882

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Description

FIELD OF THE INVENTION

[0001] This invention pertains to the construction of log walls and utilizes natural tapered whole logs which are fit together and laid horizontally on top of each other. Traditionally, this type of wall construction has always been done by hand, using a chainsaw. A lateral notch, also known as a groove or cope, is cut with a chainsaw from the underside or belly of each log, and runs the full length of each wall log. This is an extremely heavy, labour intensive and repetitive task. This invention will eliminate the time-consuming hard labour involved, but will still result in the hand-crafted look of tapered log walls. The art and craft of building with natural logs continues to gain appeal, and removing this labour intensive aspect of the construction will allow time for log builders to focus more on innovative and creative hand-crafted corner notches and other details unique to their own style of building.

DESCRIPTION OF THE PRIOR ART

[0002] There are various means by which horizontally stacked logs or milled timbers are notched or joined together. With conventional "milled" or "machine-cut" house logs, there is a huge amount of waste wood created. D-shaped logs and double tongue and groove style logs are machined out of dimensional timbers and then profiled to resemble "real logs". Lathed (round) logs are all milled to exactly the same diameter; the tip size of the tree determines the final size of the log. An enormous amount of waste wood is generated as the log is lathed down to it's smallest dimension, often being as little as 6 inches in diameter. Up to 40% of the wood becomes waste.

[0003] Conventional milling systems are also limited in the length of logs that can be used. An unfortunate consequence is the practice of "end-butting" timbers within a wall; ie: 2 - 20 ft. pieces of log are butted end to end to create 1 - 40 ft. length. This negatively affects the building both esthetically and structurally and can cause air leak problems.

[0004] United States Patent No. 4,312,161 to Goldade teaches the shaping of elongate cylindrical structural members for their interfitting in the construction of walls or similar structures. This provides an example of machine profiled timbers that have been cut from whole logs.

[0005] United States Patent No. 4,903,447 to McDade teaches a variation on machine profiled logs which utilizes a double tongue and groove type of joinery and creates an exterior wall profile that resembles shiplap siding.

[0006] United States Patent No. 4,510,724 to Magnuson teaches timber construction which incorporates the natural taper of the timbers and uses a uniform notching system for corner joinery. However, this system again relies on each timber being profiled to exact matching dimensions, again generating substantial amounts of wood waste and increased costs. There are machines currently utilizing curved planer heads to peel logs. As well, hydraulic equipment is being widely used in the wood manufacturing sector to position logs, align them on a determined plane, rotate them and mill them as required. Laser levellers are used in conjunction to ensure accuracy.

[0007] BE-A-548 733 discloses a manual process of shaping whole natural logs using a gauging tool and comprising the steps of selecting logs of similar taper and cutting a concave groove in the upper surface of the log to form a lengthwise lateral notch in the upper surface, the concave groove having a predetermined curvature in accordance with a diameter range of the logs.

[0008] CA-A-918 882 discloses a process for milling whole natural logs in which an upper convex surface and a parallel lower concave surface are machined into the logs, the remaining surface remaining non-machined.

SUMMARY OF THE INVENTION

[0009] There is a growing world-wide shortage of timber, thus, the reduced amount of wood that is being harvested must be used to maximum advantage, achieving the highest value-added possible. This invention, embodied in a process for milling whole natural logs for log wall construction according to claim 1 and a method for building a log wall construction using such logs according to claim 7 allows for the full utilization of each naturally tapered log used in wall construction. Essentially, only the bark and a very small portion of log are unused, and the bark can be sold as landscape mulch.

COMPARATIVE TABLE SHOWING WOOD CONSUMPTION BASED ON TYPE AND SIZE OF LOGS USED

[0010]

Number of logs required to gain 120 inches (or 10 ft) in wall height:		
6" double tongue and groove	20 logs high	maximum obtainable length is 24 feet

(continued)

Number of logs required to gain 120 inches (or 10 ft) in wall height:		
8" double tongue and groove	**15 logs high**	**maximum obtainable length is 24 feet**
10" round lathed logs	**12 logs high**	**13" average diameter logs must be used and 30-40% of the wood becomes waste; maximum obtainable length is 28 ft.**
10" tip, 16" butt trees (natural tapered logs) -13" average diameter	**9.2 logs high**	**full length trees can be used (up to 55 ft.long) resulting in maximum height gain per round**

[0011] There are also substantial savings in the cost of labour due to increased productivity when using a tapered log milling machine to create lateral grooves. It is estimated that this process will produce 6-8 times more lineal footage of lateral grooves per man day than a log builder using a chainsaw. This would allow increased time for the more individualized and creative aspects of craftsmanship involved in the log construction industry. As well, it is anticipated that the widespread use of this process would result in reduced incidence of back-related injuries now common in this industry, since the repetitive and prolonged use of the chainsaw to create lateral grooves would be eliminated.

[0012] Increased thermal mass of log buildings and higher R-values of log walls are achieved, due to the larger diameter of logs using the natural tapered milling method. Greater flexibility in design is also possible due to the long lengths of logs that can be used; no end-butting is necessary. Milled natural tapered logs would have the appearance and appeal of hand-crafted or hand-scribed joinery.

DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 is a perspective view of a section of log wall illustrating the natural taper of the logs as they lay, alternating a butt 11 (largest diameter of a log) with a tip 12 (smallest diameter of a log) and achieving level every 2 rounds (a "round" is a single layer of logs around the complete perimeter of a building).

FIG.2 is an end view of a log wall illustrating the alternating butts 11 and tips 12 of logs and indicating common curvature 13, matching the milled convex surface of the top of each log to the milled concave surface on the underside of the log above it.

FIG.3 is an enlarged end view of a log wall illustrating the use of a common curvature 13 on various diameters of logs resulting in the exact matching of convex to concave surfaces, joining log to log and illustrating the amount of wood removal in the process: from the underside of a log 14 and from the top side of a log 15.

DETAILED DESCRIPTION OF THE INVENTION

[0014] This process utilizes a machine to create the lateral notch, also known as a groove or cope, on the underside of a house building log and to mill a matching convex surface on the top of each log, creating walls that maintain the natural taper of each whole log used (refer to FIG. 1). Referring now to FIG. 2, 13 the convex curvature of the top of each log will be milled to match the concave curvature on the bottom of the log sitting directly above it, using a common curvature 13 for specified diameters. A 16 inch diameter curvature is defined as being equal to any portion of the perimeter of a 16 inch circle. Similarly, a 10 inch diameter curvature equals any portion of the perimeter of a 10 inch circle; refer to FIG.3 13. The key factor in this process is to use logs of similar taper and mill them to *exactly* the same degree of taper. This is accomplished by positioning the log that is to be milled so that the top surface is on a horizontal plane. The concave groove is then cut into that surface. The log is then mechanically rotated 180 degrees so the opposite surface of the log is on top. Once again, hydraulic lifters and laser levellers position the log so that the top surface is essentially on a horizontal plane, with the log held in position so that the planing process results in creating the identical degree of taper in every log. A matching convex curvature is then milled on this surface. By using the same curvature throughout, no matter what diameter of log is used, level wall height is achieved every 2 rounds* (refer to FIG.1); this is contingent upon logs being stacked so that, at each end of the wall being built, a butt 11 (or largest diameter of a log) alternates with a tip 12 (or smallest diameter of a log); refer to FIG. 1.

[0015] In the process of milling and matching concave to convex surfaces, an extremely small amount of waste wood 14 and 15, is generated.

*A "round" is a single layer of logs around the complete perimeter of a building

[0016] Trees grown in the same area have similar taper. Ideal house logs have 1 inch of taper in every 10 feet of length. If the taper is greater than that, the machine can still be used with the same results. Cutting blades with different curvatures would be used for different diameters of logs, however, with this concept, the same curvature blade and the same degree of taper in the logs used must be maintained for any one complete building. Logs ranging from 5 to 10 inches in diameter would use a 10" curvature blade. Logs ranging from 10 to 16 inches in diameter would use a 16 inch curvature blade. Logs ranging form 16 to 24 inches would use a 24 inch curvature blade.

[0017] A natural tapered house log milling machine would be designed so that the machine head would move down the length of the log, as opposed to the equipment being stationary and the log being turned and moved. This would enable logs of up to 55 feet in length to be milled.

Claims

1. A process for milling whole natural logs for log wall construction, the process comprising steps of:

    (i) selecting logs of similar taper;
    (ii) positioning one of the selected logs for a first phase of milling such that a top surface thereof is in a horizontal plane;
    (iii) in the first phase of milling, cutting a concave groove in the upper surface of the log to form a lengthwise lateral notch in the upper surface, the concave groove having a predetermined curvature in accordance with a diameter range of the logs;
    (iv) mechanically rotating the log through 180° to expose an opposite surface;
    (v) positioning the opposite surface in an essentially horizontal plane;
    (vi) in a planing process, planing the opposite surface to provide a taper identical to a taper of the top surface;
    (vii) in a second phase of milling, milling a convex curvature on the opposite surface matching the predetermined curvature; and
    (viii) repeating steps (ii) to (vii) for each of the selected logs.

2. The process of claim 1, wherein the selected logs have a maximum butt diameter approximately 15 cm (6 inches) greater than the minimum tip diameter.

3. The process of claim 2, wherein for selected logs the predetermined curvature is approximately equal to the maximum butt diameter.

4. The process of claim of claim 1, wherein the predetermined curvature is about 25 cm (10 inches) when the diameter range of the logs is about 13 - 25 cm (5 - 10 inches).

5. The process of claim of claim 1, wherein the predetermined curvature is about 41 cm (16 inches) when the diameter range of the logs is about 25 - 41 cm (10 - 16 inches).

6. The process of claim of claim 1, wherein the predetermined curvature is about 61 cm (24 inches) when the diameter range of the logs is about 41 - 61 cm (16 - 24 inches).

7. A method for building a log wall construction, using logs milled according to the process of any one of claims 1 to 6, comprising:

    (a) laying a first round of logs such that a butt end of each log abuts a tip end of an adjacent log, and the convex curvature of the opposite surface of each log forms a top of the first round;
    (b) stacking a second round of logs on the first round such that each butt end of the second round of logs alternates with a tip end of the first round, and the concave grooves of the logs of the second round face downwards and coincide with the convex curvatures of the first round; and
    (c) repeating steps (a) and (b) to form the log wall construction such that every second round provides a level wall height.

Patentansprüche

1. Verfahren zum Fräsen von ganzen natürlichen Baumstämmen für Block-Wandkonstruktionen, umfassend die fol-

genden Schritte:

(i) Auswählen von Baumstämmen mit ähnlicher Verjüngung;
(ii) Positionieren eines der ausgewählten Baumstämme für eine erste Fräsphase derart, dass die obenliegende Fläche desselben in einer horizontalen Ebene liegt;
(iii) Schneiden einer konkaven Nut in die obere Fläche des Baumstamms zur Ausbildung einer längsgerichteten seitlichen Kerbe während der ersten Fräsphase, wobei die konkave Nut eine vorgegebene Krümmung im Durchmesserbereich der Baumstämme aufweist;
(iv) mechanisches Drehen des Baumstamms um 180 Grad zwecks Zugang zu einer gegenüberliegenden Fläche;
(v) Positionieren der gegenüberliegenden Fläche in einer im wesentlichen horizontalen Ebene;
(vi) Hobeln der gegenüberliegenden Fläche in einem Hobelvorgang zur Schaffung einer Verjüngung, die der Verjüngung an der oberen Fläche entspricht;
(vii) Fräsen einer konvexen Krümmung an der gegenüberliegenden Fläche passend zu der vorgegebenen Krümmung in einer zweiten Fräsphase; und
(viii) Wiederholen der Schritte (ii) bis (vii) für jeden der ausgewählten Baumstämme.

2. Verfahren nach Anspruch 1, bei dem die ausgewählten Baumstämme einen maximalen Stumpfdurchmesser aufweisen, der etwa 15 cm (6 Zoll) größer ist, als der kleinste Spitzendurchmesser.

3. Verfahren nach Anspruch 2, bei dem für die ausgewählten Baumstämme die vorgegebene Krümmung in etwa gleich dem maximalen Stumpfdurchmesser ist.

4. Verfahren nach Anspruch 1, bei dem die vorgegebene Krümmung circa 25 cm (10 Zoll) beträgt, wenn der Durchmesserbereich der Baumstämme circa 13 bis 25 cm (5 bis 10 Zoll) beträgt.

5. Verfahren nach Anspruch 1, bei dem die vorgegebene Krümmung circa 41 cm (16 Zoll) beträgt, wenn der Durchmesserbereich der Baumstämme circa 25 bis 41 cm (10 bis 16 Zoll) beträgt.

6. Verfahren nach Anspruch 1, bei dem die vorgegebene Krümmung circa 61 cm (24 Zoll) beträgt, wenn der Durchmesserbereich der Baumstämme circa 41 bis 61 cm (16 bis 24 Zoll) beträgt.

7. Verfahren zur Erstellung einer Block-Wandkonstruktion unter Verwendung von Baumstämmen, die nach dem Verfahren nach einem der Ansprüche 1 bis 6 gefräst wurden, umfassend:

(a) Auslegen einer ersten Runde von Baumstämmen derart, dass die Stumpfenden eines jeden Baumstamms gegen das Spitzenende eines benachbarten Baumstamms anliegen und die konvexe Krümmung der gegenüberliegenden Fläche eines jeden Baumstamms die Oberseite der ersten Runde bildet;
(b) Stapeln einer zweiten Runde von Baumstämmen auf der ersten Runde derart, dass jedes Stumpfende der zweiten Runde von Baumstämmen mit einem Spitzenende der ersten Runde abwechselt und die konkaven Nuten der Baumstämme der zweiten Runde nach unten zeigen und mit den konvexen Krümmungen der ersten Runde zusammenfallen; und
(c) Wiederholen der Schritte (a) bis (b) zur Erstellung der Block-Wandkonstruktion, derart, dass jede zweite Runde eine Wandhöhenstufe bereitstellt.

Revendications

1. Procédé pour usiner des rondins naturels entiers pour une construction à parois en rondins, le procédé comprenant les étapes consistant à :

(i) choisir des rondins de conicité analogue ;
(ii) positionner l'un des rondins choisis pour une première phase d'usinage de telle sorte qu'une surface supérieure de celui-ci se situe dans un plan horizontal ;
(iii) dans la première phase d'usinage, découper une rainure concave dans la surface supérieure du rondin afin de former dans la surface supérieure une encoche latérale dans le sens de la longueur, la rainure concave ayant une courbure prédéterminée conformément à une plage de diamètres des rondins ;
(iv) faire tourner mécaniquement le rondin sur 180° pour exposer une surface opposée ;

(v) positionner la surface opposée dans un plan sensiblement horizontal ;
(vi) dans un procédé de rabotage, raboter la surface opposée pour assurer une conicité identique à une conicité de la surface supérieure ;
(vii) dans une seconde phase d'usinage, usiner une courbure convexe sur la surface opposée s'appariant à la courbure prédéterminée ; et
(viii) répéter les étapes (ii) à (vii) pour chacun des rondins choisis.

2. Procédé selon la revendication 1, dans lequel les rondins choisis ont un diamètre de souche maximal d'approximativement 15 cm (6 pouces) de plus que le diamètre de tête minimal.

3. Procédé selon la revendication 2, dans lequel pour des rondins choisis la courbure prédéterminée est approximativement égale au diamètre de souche maximal.

4. Procédé selon la revendication 1, dans lequel la courbure prédéterminée est d'environ 25 cm (10 pouces) lorsque la plage de diamètres des rondins est d'environ 13-25 cm (5-10 pouces).

5. Procédé selon la revendication 1, dans lequel la courbure prédéterminée est d'environ 41 cm (16 pouces) lorsque la plage de diamètres des rondins est d'environ 25-41 cm (10-16 pouces).

6. Procédé selon la revendication 1, dans lequel la courbure prédéterminée est d'environ 61 cm (24 pouces) lorsque la plage de diamètres des rondins est d'environ 41-61 cm (16-24 pouces).

7. Procédé pour édifier une construction à parois en rondins, à l'aide de rondins usinés conformément au procédé tel que défini à l'une des revendications 1 à 6, comprenant les opérations consistant à :

(a) poser un premier tour de rondins de telle sorte qu'une extrémité de souche de chaque rondin vienne en butée contre une extrémité de tête d'un rondin adjacent, et la courbure convexe de la surface opposée de chaque rondin forme une partie supérieure du premier tour ;
(b) empiler un second tour de rondins sur le premier tour de telle sorte que chaque extrémité de souche du second tour de rondins alterne avec une extrémité de tête du premier tour, et les rainures concaves des rondins du second tour sont tournées vers le bas et coïncident avec les courbures convexes du premier tour ; et
(c) répéter les étapes (a) et (b) pour former la construction à parois en rondins de telle sorte que chaque second tour fournisse une hauteur de paroi de niveau.

FIG.1

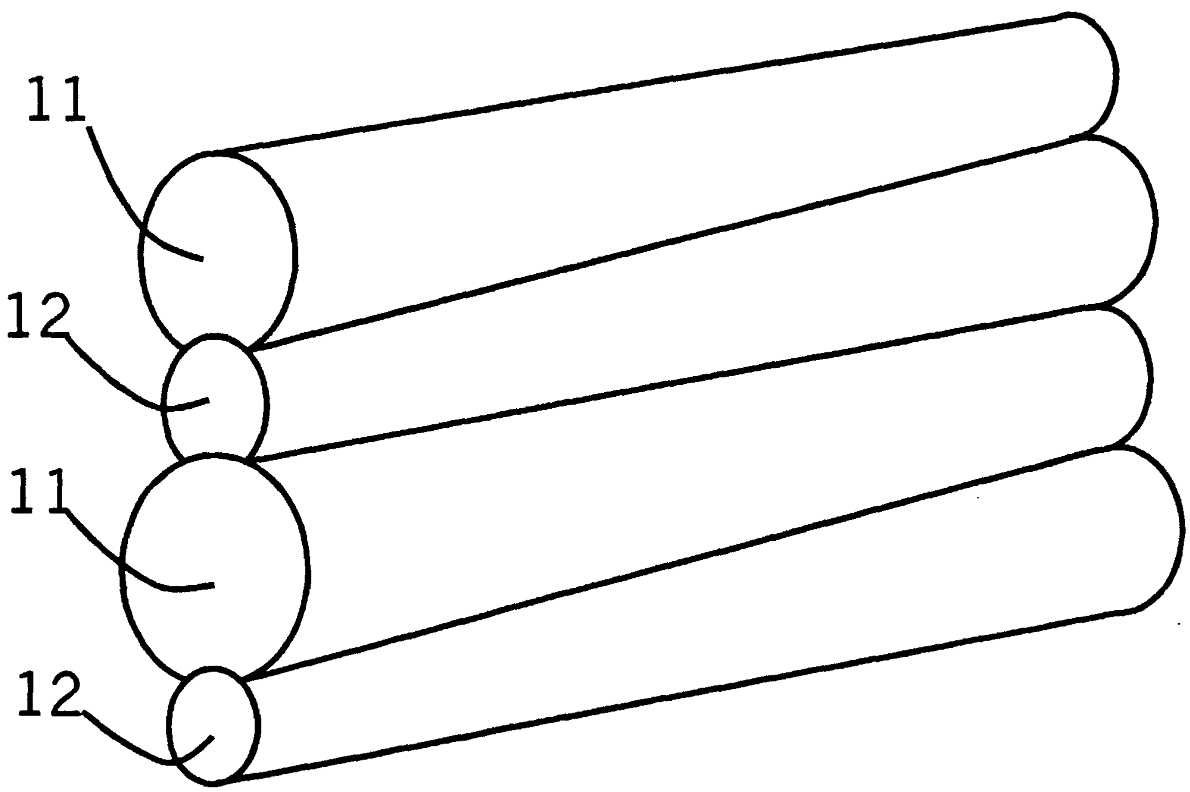

FIG.2

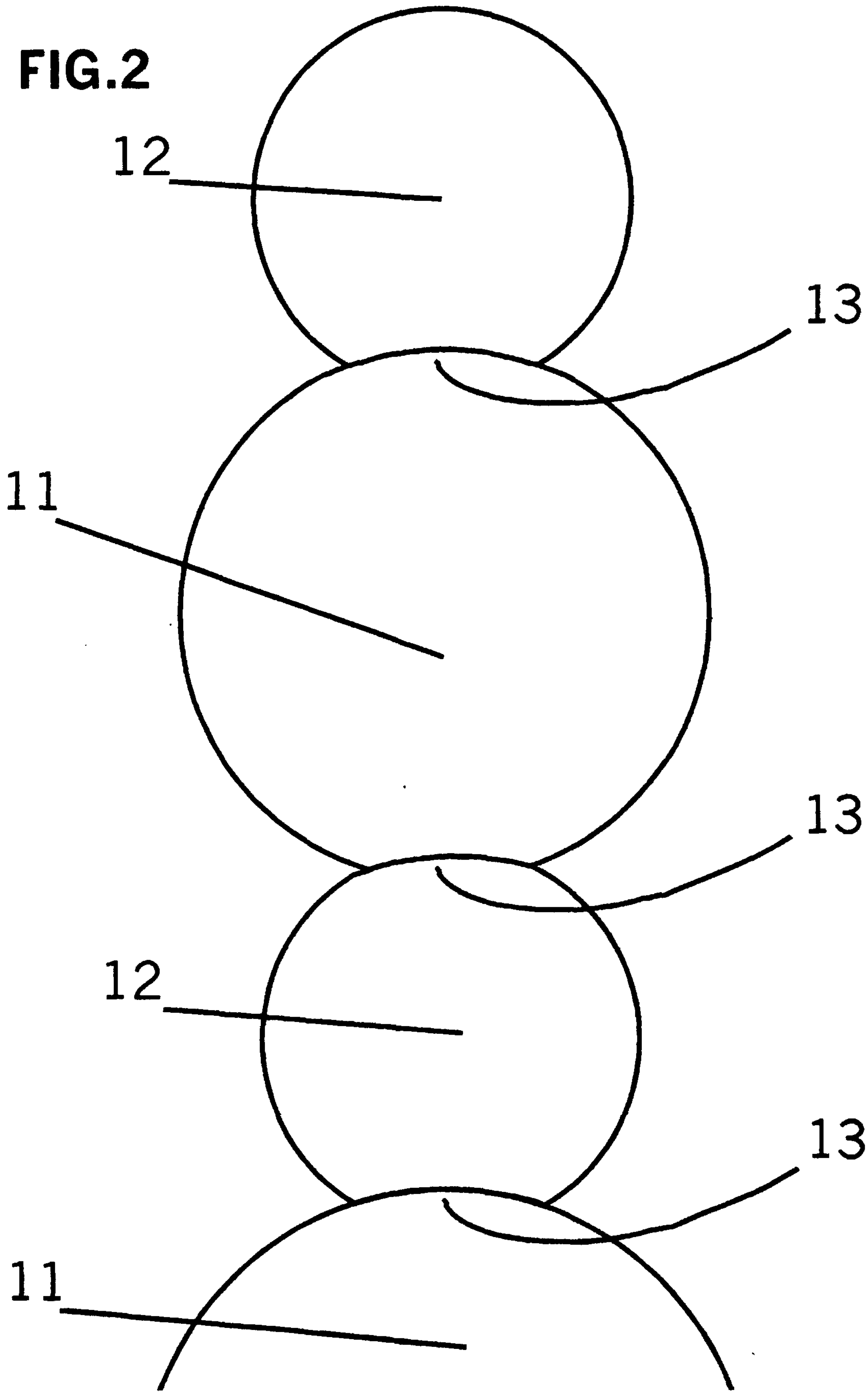

FIG.3