



US 20150033816A1

(19) **United States**

(12) **Patent Application Publication**
Neelakandan et al.

(10) **Pub. No.: US 2015/0033816 A1**

(43) **Pub. Date: Feb. 5, 2015**

(54) **DOUBLE ENDED HEMMING ROLLER**

Publication Classification

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(51) **Int. Cl.**
B21D 39/02 (2006.01)

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(52) **U.S. Cl.**
CPC *B21D 39/023* (2013.01)
USPC *72/252.5*

(21) Appl. No.: **14/341,007**

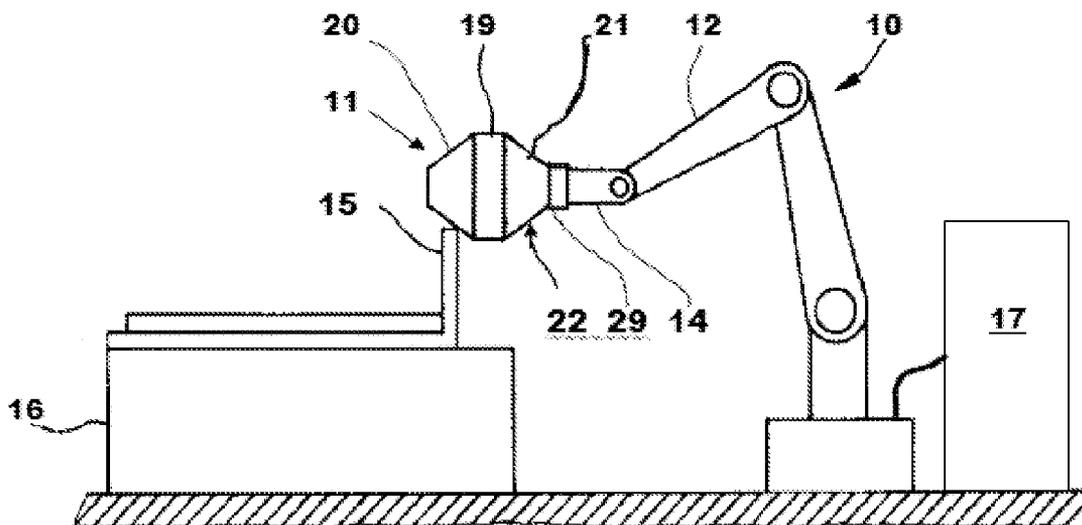
(57) **ABSTRACT**

(22) Filed: **Jul. 25, 2014**

(30) **Foreign Application Priority Data**

Jul. 31, 2013 (IN) C460/CHE/2013

A hemming roller **22** for a hemming apparatus **10** is disclosed having two frusto-conical hemming surfaces **20** and **21** so as to allow the hemming roller **22** to be reversibly mounted on a spindle shaft **14** of the hemming apparatus **10** to allow both of the hemming surfaces **20** and **21** to be used for hemming.



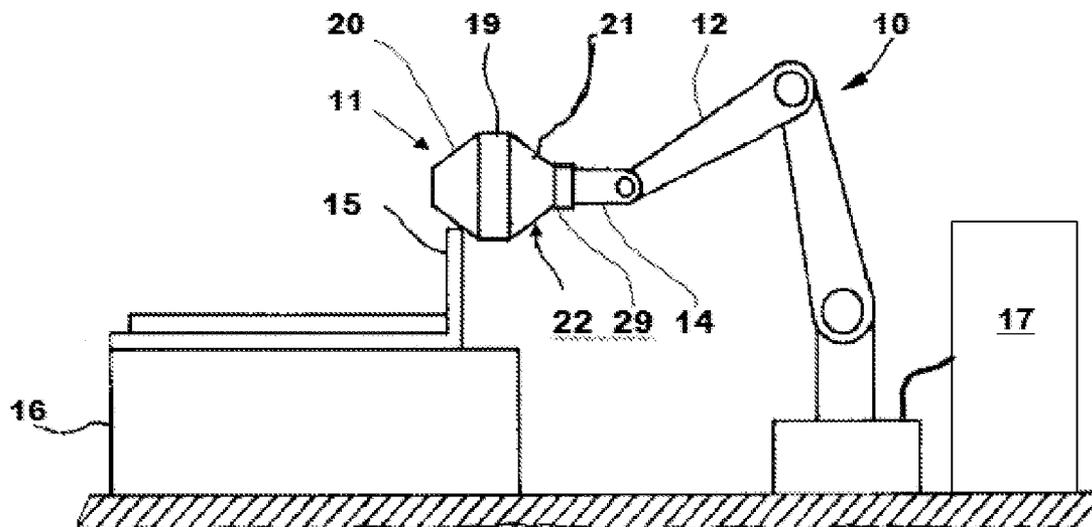


FIG.1

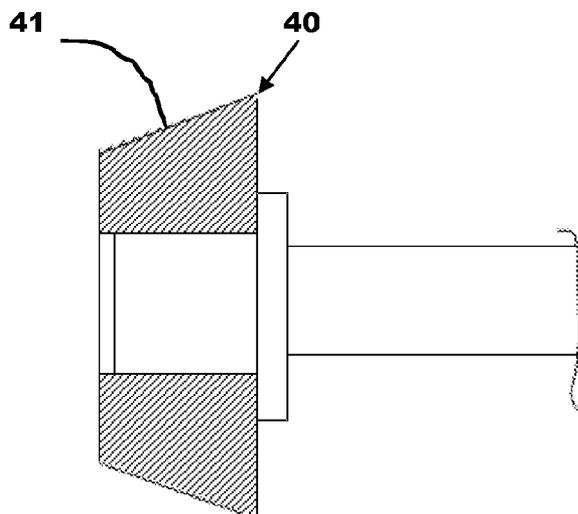


Fig.2

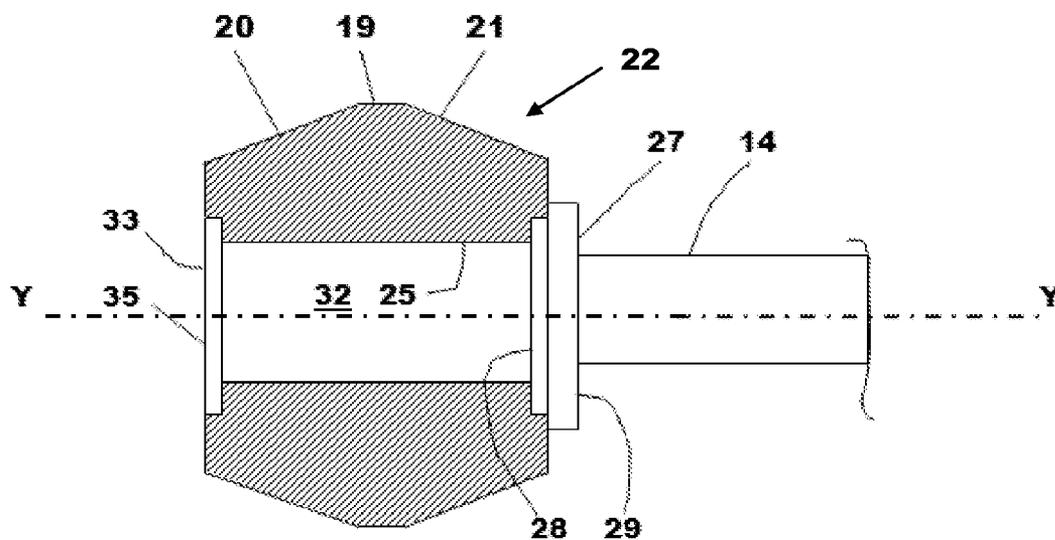


FIG.3

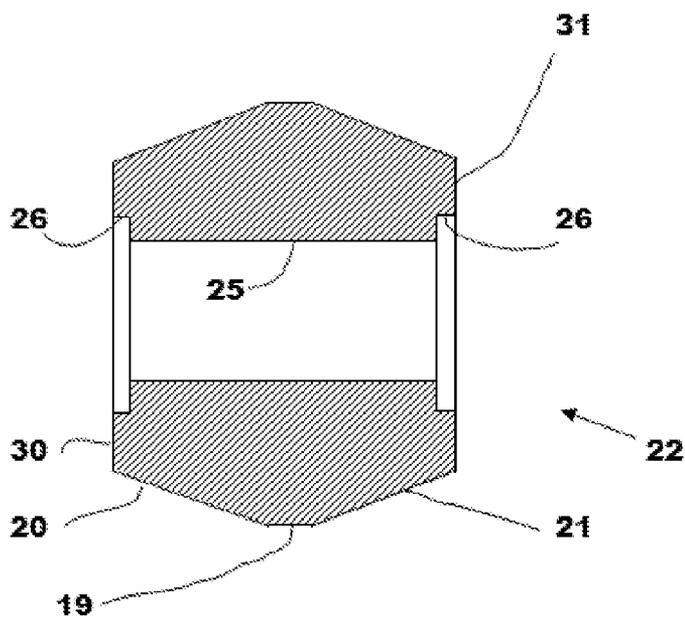


Fig.4

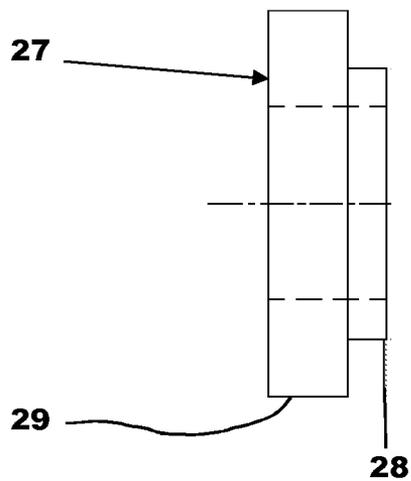


Fig.5a

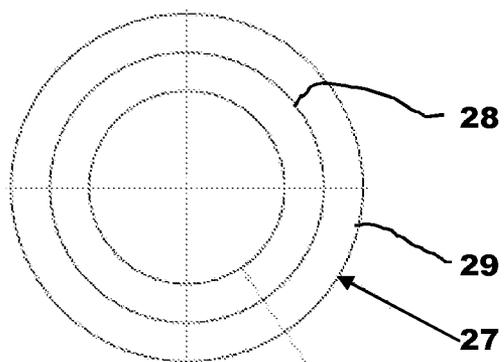


Fig.5b

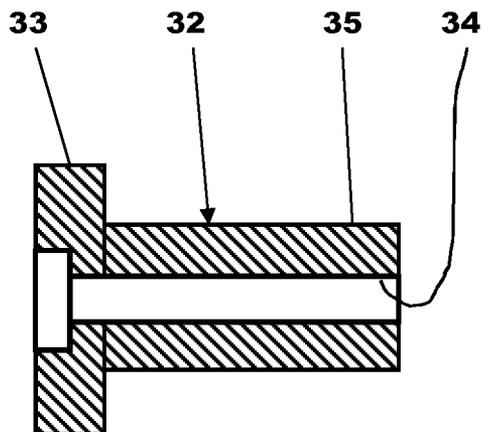


Fig.6

DOUBLE ENDED HEMMING ROLLER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims foreign priority benefits under 35 U.S.C. §119 (1)-(d) to IN C460/CHE/2013 Filed Jul. 31, 2013, which are hereby incorporated by reference in their entirety.

TECHNICAL FIELD

[0002] This invention relates to a roller type hemming apparatus for hemming metal panels and more particularly to a hemming roller having a longer working life.

BACKGROUND

[0003] In the automotive industry, metal panels are extensively used to form the automotive hood, door panels, and the like. Robotic hemming apparatus such as disclosed in US publication 2011/0107807 are conventionally used to attach two metal panels together.

[0004] A conventional hemming apparatus has a roller mounted to the end of the robotic arm so that a hemming head together with its roller move in synchronism with the robotic arm. The work piece is hemmed by rolling the hemming surface of the roller, under pressure, along the edge of the work piece.

[0005] In order to achieve good hemming with a conventional hemming apparatus, the robot must move the hemming roller along the edge of the work piece at a constant distance from the work piece. The quality of the hemming operation depends on the condition of the hemming surface and once it is worn, and it is difficult to continue a quality hemming operation. As work progresses, the circumference of the hemming roller becomes worn out, thus resulting in an imperfect hemming. To continue the hemming operation, the worn out hemming roller has to be replaced by a new hemming roller. The cost of a hemming roller is considerably high and frequent replacements of worn out hemming rollers with new one is cost ineffective.

[0006] A shortcoming with the previously known hemming rollers is that once the single hemming surface has worn out, the hemming roller has to be replaced by a new one.

SUMMARY

[0007] It is an object of the invention to provide a hemming roller for a robotic hemming apparatus with an increased working life.

[0008] According to a first aspect of the invention there is provided a hemming head comprising a hemming roller having two ends and a frusto-conical hemming surface on both ends.

[0009] The frusto-conical hemming surfaces may be separated by a cylindrical central portion.

[0010] The hemming roller may be mountable at either end so that both of the hemming surfaces of the hemming roller can be used to perform a hemming operation.

[0011] The hemming roller may have a central bore used to mount the hemming roller on a spindle shaft.

[0012] The central bore may have a counter bore located at both ends.

[0013] The hemming head may further comprise a retainer and a spacer to rotatably mount the hemming roller on the spindle shaft.

[0014] According to a second aspect of the invention there is provided a hemming machine having a hemming head constructed in accordance with said first aspect of the invention, the hemming machine having an arm used to manipulate the hemming head such that one of the hemming surfaces of the hemming roller is engageable with a work piece to perform a hemming operation on the work piece.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is a schematic side view of a robotic hemming apparatus according to a second aspect of the invention having a hemming head according to a first aspect of the invention;

[0016] FIG. 2 is a schematic side view of a prior art hemming roller mounted on a spindle shaft;

[0017] FIG. 3 is a side view of a double sided hemming roller according to the invention mounted on a spindle shaft;

[0018] FIG. 4 is a cross-section through the double sided roller shown in FIG. 3;

[0019] FIGS. 5a and 5b are side and end views of a spacer for the hemming head; and

[0020] FIG. 6 is a cross-section through a retainer for the hemming head.

DETAILED DESCRIPTION

[0021] With reference to the FIG. 1 there is shown a robotic hemming apparatus 10 comprising a roller hemming head 11 which is attached to a robotic arm 12. A hemming roller 22 is releasably attached to a spindle shaft 14 of the robotic arm 12. A work piece 15 such as a sheet of metal to be hemmed is located on a base 16. A programmable controller 17 is connected to the robotic hemming apparatus 10 to control the motion of the robotic arm 12 to carry out the hemming process to hem two panels together.

[0022] With reference to FIG. 2, there is shown a prior art hemming roller 40 having only one hemming surface 41.

[0023] With reference to FIGS. 3-6, there is shown on a larger scale the double ended hemming roller 22 in accordance with the invention. The double ended hemming roller 22 has a cylindrical center portion 19 and two frusto-conical tapering hemming surfaces 20 and 21 on respective first and second ends 30 and 31 of the hemming roller 22.

[0024] The hemming roller 22 has a central longitudinal axis Y-Y. The hemming roller 22 has a bore 25 extending along the central axis Y-Y between the two ends 30 and 31. Each end of the bore 25 ends in a counter bore 26.

[0025] A stepped spacer 27 has two portions 28 and 29 of differing outside diameter. The portion 28 of spacer 27 is inserted into the counter bore 26 in the first end 30 so that a flange formed by the portion 29 of the spacer 27 faces the spindle shaft 14. The hemming roller 22 is rotatably supported by the spindle shaft 14 between the spacer 27 and a retainer 32.

[0026] The retainer 32 is used to secure the hemming roller 22 to the spindle shaft 14. The retainer 32 has a cylindrical portion 35 which is engageable with the bore 25 in the hemming roller 22. The retainer 32 also has a flange portion 33 which is a push fit in the counter bore 26 in the second roller end 31. The retainer 32 has a central hole 34 through which a threaded fastener extends to secure the hemming roller 22 to the spindle shaft 14. When assembled, the distance between the flange 33 on the retainer 32 and the flange 29 is greater

than the length of the bore 25 between the two counter bores 26 so as to provide a running clearance there between.

[0027] The portions 28, 33 of the spacer 27 and the retainer 32 that fit in the counter bores 26 of the hemming roller 22 are of the same diameter so that the hemming roller 22 can be reversibly mounted to allow both hemming surfaces 20, 21 to be used.

[0028] When a first one of the hemming surfaces, 20 of the double sided hemming roller 22 has been worn out, the hemming roller 22 can still be utilized by removing it from the spindle shaft 14, rotating it and mounting it such that the second hemming surface 21 is now positioned away from the spindle shaft 14 and becomes the working surface.

[0029] Advantageously, a double sided hemming roller according to the invention solves the above referred to wear problem by providing hemming surfaces on both ends.

[0030] By utilizing both the hemming surface of the hemming roller, the life of the hemming roller has been increased and the cost of roller replacements has been halved increasing the economy of production without compromising quality.

[0031] Further, a double sided roller according to the invention can be used without any further modifications on an existing robotic roller hemming apparatus.

[0032] A double sided roller constructed in accordance with the invention has been tested and the results have confirmed that both the working surfaces of the double sided hemming roller can be utilised before replacing the hemming roller.

[0033] It will be appreciated by those skilled in the art that although the invention has been described by way of example with reference to one or more embodiments it is not limited to

the disclosed embodiments and that alternative embodiments could be constructed without departing from the scope of the invention as defined by the appended claims.

What is claimed:

1. A hemming head comprising a hemming roller having two ends and a frusto-conical hemming surface on both ends.

2. A hemming head as claimed in claim 1 wherein the frusto-conical hemming surfaces are separated by a cylindrical central portion.

3. A hemming head as claimed in claim 1, wherein the hemming roller is mountable at either whereby both of the hemming surfaces of the hemming roller may be used to perform a hemming operation.

4. A hemming head as claimed in claim 1, wherein the hemming roller has a central bore used to mount the hemming roller on a spindle shaft.

5. A hemming head as claimed in claim 4, wherein the central bore has a counter bore located at both ends.

6. A hemming head as claimed in claim 4, wherein the hemming head further comprises a retainer and a spacer to rotatably mount the hemming roller on the spindle shaft.

7. A hemming machine comprising:

a hemming head, said hemming head having a hemming roller with two ends;

a frusto-conical hemming surface on each of said two ends; and

an arm that may be manipulated to engage a work piece with said hemming head thereby causing the hemming surfaces of the hemming roller to perform a hemming operation on the work piece.

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