Feb. 19, 1963 H. E. VAUGHN 3,077,916

EXPANDER TOOL

Filed Aug. 12, 1960

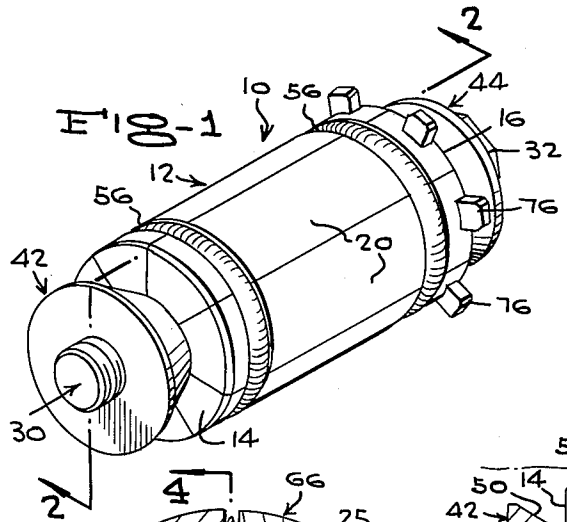

FIG-1

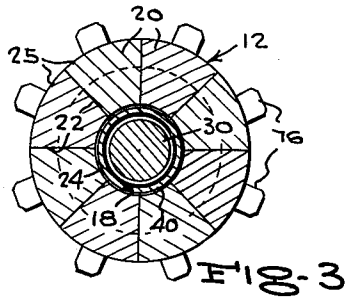

FIG-3

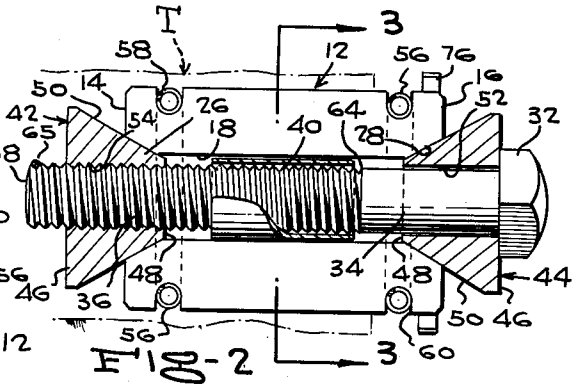

FIG-2

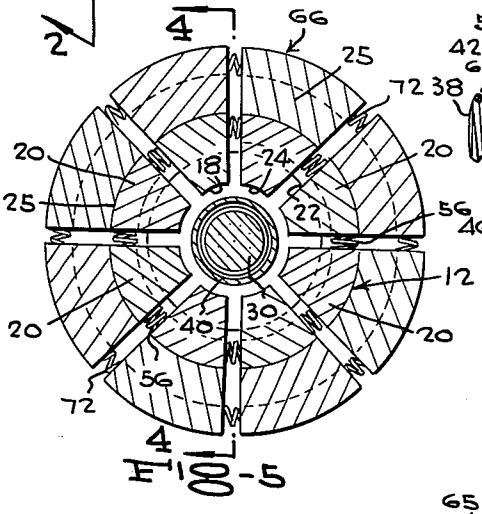

FIG-5

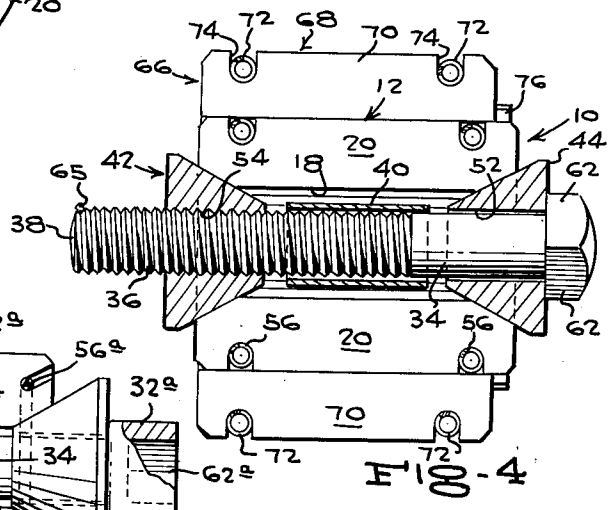

FIG-4

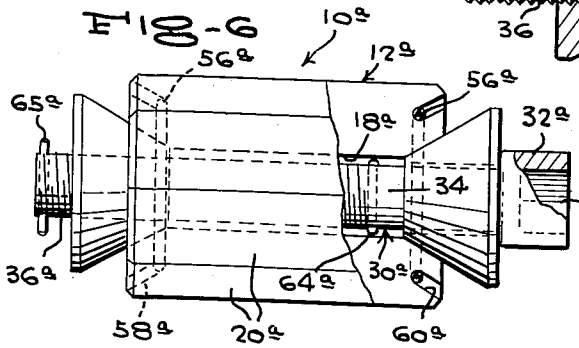

FIG-6

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EXPANDER TOOL

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This invention relates to a novel expander tool for truing thin-walled tubing, such as engine exhaust pipes and mufflers, and the like.

The primary object of the invention is to provide a simple, efficient, and easily used and time and labor saving tool of the kind indicated.

Another object of the invention is to provide, in a tool of the character indicated, simple and easily applied adapters for use thereon which adapt the tool for truing tubing larger in diameter than the normal capacity of the tool.

A further object of the invention is the provision of a tool of the character indicated above whose body is a hollow spring-contracted expansible cylinder which is expanded by wedges engaged in the ends thereof, the wedges being forced toward each other for expanding the body by means of a rotary shaft extending through the wedges and the body and threaded in one of the wedges.

Other important objects and advantageous features of the invention will be apparent from the following description and the accompanying drawings, wherein, for purposes of illustration only, a specific form of the invention is set forth in detail.

In the drawings:

FIGURE 1 is a perspective view of a tool of the invention;

FIGURE 2 is a longitudinal section taken on the line 2—2 of FIGURE 1, portions being broken away and in section;

FIGURE 3 is a transverse section taken on the line 3—3 of FIGURE 2;

FIGURE 4 is a view similar to FIGURE 3, showing an adapter applied to the tool; and taken on line 4—4 of FIGURE 5;

FIGURE 5 is an enlarged transverse section taken on the 5—5 of FIGURE 4; and,

FIGURE 6 is a side elevation, partly broken away, of a modified form of the invention.

Referring in detail to the drawings, wherein like and related numerals designate like and related parts throughout the several views, and first to FIGURES 1 to 5, the tool therein shown, and generally designated 10, comprises an elongated, uniformly cylindrical expansible body 12, having first and second flat ends 14 and 16, respectively, and an axial bore 18 extending therethrough. The body 12 is composed of a desirable plurality of similar segmental cross-section segments 20 having radially outwardly angled flat sides 22, inner edges 24, and convex outer edges 25. Related ends of the segments 20 are formed with longitudinally inwardly extending, radially inwardly angled concavities 26 and 28, which, when the body 12 is contracted, define annular wedge surfaces at the ends of and merging into the bore 18.

Extending spaced within and through the bore 18 is a bolt 30, which is substantially longer than the body 12 and has an enlarged head 32 on one end thereof. The shank of the bolt 30 has a relatively short smooth portion 34 adjacent to and extending inwardly from the head, and a relatively long threaded portion 36 which extends from the smooth portion 34 to the free end 38 of the shank. A spacer sleeve 40, substantially shorter than the body 12, is loosely circumposed on the shank, and fits loosely in the bore 18.

Similar but reversed frusto-conical first and second wedges 42 and 44, respectively, are circumposed on the bolt shank, at the ends of the body 12. The wedges having outer ends 46 which are larger in diameter than the bore 18, inner ends 48 which are smaller in diameter than the bore, and wedge surfaces 50 which are angled and convexed to conformably engage in the concavities 26 and 28 at the ends of the bore 18. The second wedge 44 is shorter than the smooth portion 34 of the bolt shank, and has a smooth bore 52 therethrough, securing the smooth portion 34. The first wedge 42 has therethrough a threaded bore 54 which is threaded on the threaded shank portion 36.

For contracting the body 12 by forcing the segments 20 radially inwardly and toward each other, contractile spring means is provided, which can comprise, as shown in FIGURES 1 and 2, resilient and stretchable O-rings 56 which surround the body 12 and are seated in circumferential external grooves 58 and 60 in the body at locations close to related ends thereof.

In the form of the invention shown in FIGURE 6, and generally designated 10*a*, the contractile spring means comprise resilient and stretchable O-rings 56*a* which are seated in inwardly canted annular grooves 58*a* and 60*a* which are formed in the ends of the body 12*a*, whereby the surface of the body 12*a* is unencumbered and smooth throughout. Further, a socket head 32*a* on the bolt 30*a* instead of having wrench-receiving faces 62 thereon, as in the case of the bolt 30 of FIGURES 1 to 5, has a socket 62*a* thereon. It will be understood that any other suitable substitute arrangement for rotating the bolts may be used instead of the bolt head 32 and the socket head 32*a*, such as a cross handle (not shown).

In order to provide against the first wedge 42 coming off the free end 38 of the bolt shank, suitable stop means is provided at the end 38, such as a bead 65 of welding or the like or a cross pin 65*a* in FIGURE 6. At the meeting of the smooth portion 34 and the threaded portion 36 of the shank of the bolt 30, there is provided stop means, here shown as a bead 64 of such as welding, or a cross pin 64*a* as in FIGURE 6, to be engaged by the adjacent end of the second wedge 44 to prevent its getting onto the threaded portion. The sleeve is of a length to stop the wedges 42 and 44 from going so far into the body bore 18 and the concavities 26 and 28, as the bolt 30 is rotated in the expanding direction, as to over-expand the body 12.

The adapter 66, shown in FIGURE 4, comprises a hollow cylindrical body 68 which is of substantially the same construction as, but larger in diameter than, the body 12, being composed of segmental segments 70, with resilient and stretchable O-rings 72 seated in circumferential grooves 74 in the surface of the body. The adapter 66 is applied over the body 12 of the tool 10 in expanded condition, so that the O-rings 72 are tensioned and hold the adapter frictionally engaged on the body 12. As shown in FIGURE 5, the segments 70 of the adapter 66 are preferably similar but larger in cross-section than the tool body segments 20, and have concave inner edges 74 which are of the same width as and which conformably engage the convex outer edges 25 of the segments 20 and bear thereon. This arrangement, in effect, increases the radial depths of the tool body segments 20, and thereby renders the tool 10 capable of expanding tubing substantially larger in diameter than can be expanded by the tube body 12.

Circumferentially spaced radial lugs 76, or other suitable means can be provided on the surfaces of the tool body segments 20, at the second end 16 of the body 12, for holding the body against rotation, while the bolt 30 is being rotated, and to provide an abutment for the end of a tube T into which the tool 10 has been inserted preparatory to expansion of the tube for truing the diameter of the tube wall.

While there has been shown and described herein a preferred form of the invention, it is to be understood that the invention is not necessarily confined thereto, and that any change or changes in the structure of and in the relative arrangements of components thereof are contemplated as being within the scope of the invention as defined by the claims appended hereto.

What is claimed is:

1. An expanding tool comprising a cylindrical body composed of separate segments having outer edges and inner edges and sides, said inner edges being radially spaced from each other and defining an axial bore through the body, contractile spring means surrounding and connected to the body, said body having first and second ends, said segments having longitudinally and radially inwardly canted wedge surfaces at their outer ends which merge into their inner edges, a bolt extending through said bore, said bolt having a shank having a threaded first portion and a smooth second portion located severally at the first and second ends of the body, a bolt rotating head on said shank at the second end of the body, a first frusto-conical wedge threaded on said threaded shank portion and engaged with the wedge surfaces at the first end of the body, a second frusto-conical wedge slidably and rotatably circumposed on said smooth shank portion and bearing against the rotating head and engaged with the wedge surfaces at the second end of the body, and a spacer sleeve circumposed on the bolt shank within the body bore, to be engaged by the wedges to limit approach of the wedges toward each other and prevent over-expansion of the body, said threaded bolt shank portion having a free end, and laterally projecting first stop means on said threaded portion at said free end and located at the axially outward end of said first wedge.

2. An expanding tool comprising a cylindrical body composed of separate segments having outer edges and inner edges and sides, said inner edges being radially

spaced from each other and defining an axial bore through the body, contractile spring means surrounding and connected to the body, said body having first and second ends, said segments having longitudinally and radially inwardly canted wedge surfaces at their outer ends which merge into their inner edges, a bolt extending through said bore, said bolt having a shank having a threaded first portion and a smooth second portion located severally at the first and second ends of the body, a bolt rotating head on said shank at the second end of the body, a first frusto-conical wedge threaded on said threaded shank portion and engaged with the wedge surfaces at the first end of the body, a second frusto-conical wedge slidably and rotatably circumposed on said smooth shank portion and bearing against the rotating head and engaged with the wedge surfaces at the second end of the body, and a spacer sleeve circumposed on the bolt shank within the body bore, to be engaged by the wedges to limit approach of the wedges toward each other and prevent over-expansion of the body, said threaded bolt shank portion having a free end, and laterally projecting first stop means on said threaded portion at said free end and located at the axially outward end of said first wedge, and second laterally projecting stop means on the bolt shank at the axially inward end of said smooth portion and located at the axially inward end of said second wedge.

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