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J. DAROCI
EXPANDER TOOL

2,879,101

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2 Sheets-Sheet 1

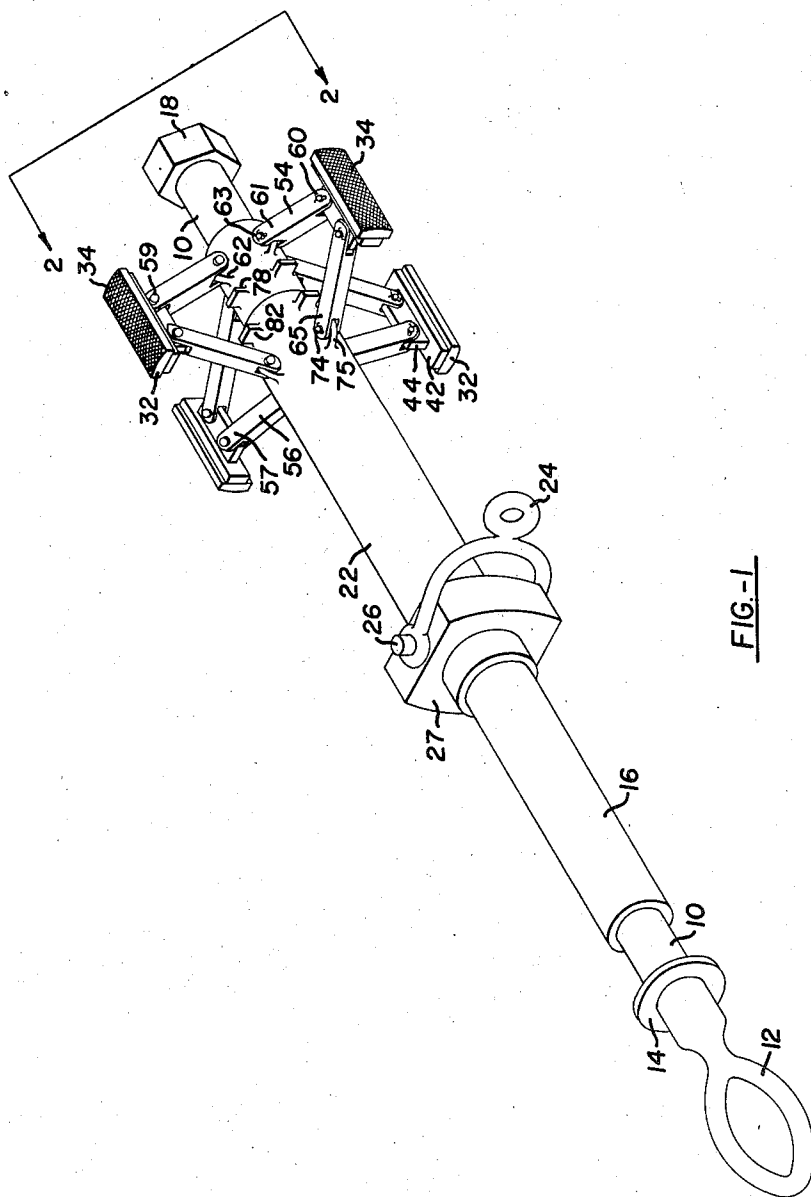


FIG. 1

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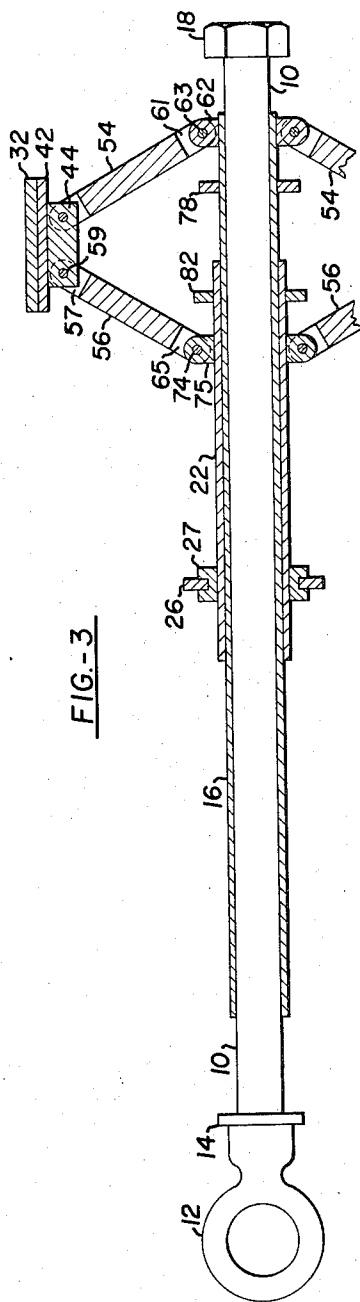


FIG-3

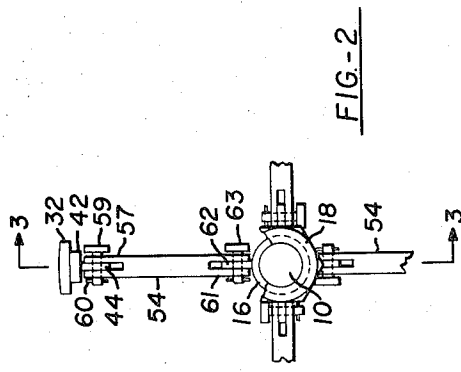


FIG-2

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2,879,101

EXPANDER TOOL

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6 Claims. (Cl. 294-97)

This invention relates to expander tools and more particularly relates to an internal expander tool for pulling, holding or extracting pipe, tubing or cylindrical objects from apparatus.

In many instances in plants it is necessary to remove tubes or pipes from furnaces or the like and to replace them with new pipes or tubes. It may be necessary in some cases to hold tubes or pipes during construction of a piece of apparatus. The tool of the present invention is useful for removing and replacing tubes in condensers, heat exchangers and other apparatus wherein a plurality of pipes or tubes are generally in a parallel arrangement.

According to the present invention, an expander tool of simple construction is provided which is designed to grip the interior wall of the tube or pipe firmly but without damage to the tube or pipe wall. The tool of the present invention is provided with spaced gripper bars or shoes pivotally attached to links. One set of links is pivoted at one end to an elongated cylinder slidably mounted on a rod. This set of links is connected at its other end to the gripper bars or shoes. Each of the links in the other set has its one end pivoted to the gripper bars or shoes and its other end pivotally mounted on a shorter larger diameter cylinder or sleeve slidably mounted on the elongated cylinder. The shorter sleeve has a release ring on it for use in collapsing the tool or expanding the tool in a pipe or tube. The solid rod comprises a puller rod or bar for spreading out the gripper bars or shoes when freeing the release ring so that the gripper bars or shoes engage the inner wall of the tube or pipe into which the tool was inserted in a collapsed condition. Then by pulling the puller rod or bar, the gripper bars or shoes tighten their hold and the pipe or tube is moved in the direction which the puller rod is pulled.

In the drawings:

Fig. 1 represents a perspective view of the expander tool of this invention;

Fig. 2 represents a front end view of the expander tool looking generally in the direction of the arrows on line 2-2 of Fig. 1; and

Fig. 3 represents a longitudinal vertical cross section taken substantially on line 3-3 of Fig. 2.

Referring now to the drawing, the reference character 10 designates a puller rod provided at one end with a pulling ring 12 and a flange or abutment 14. Rod 10 may be hollow but is preferably a solid rod. Slidably mounted on the puller rod 10 is an elongated cylinder 16 and which is concentric with the rod 10. At its other end the puller rod is provided with an abutment or flange 18 which like flange 14 is larger in diameter than the diameter of the elongated sleeve 16. Slidably mounted on the elongated cylinder 16 and concentric therewith is a shorter cylinder or sleeve 22.

Adjacent one end the sleeve 22 is provided with a re-

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lease ring 24 pivotally mounted on pivots 26 extending from block 27 secured to the sleeve 22.

In the specific form of the invention shown in the drawing there are four gripper bars or shoes 32 placed at 90° apart. These gripper bars have a knurled surface 34 to engage an interior wall of a pipe or tube and as shown in the drawing the outer surface of the gripper bars or shoes 32 is convex to more nearly conform to the interior wall of a tube or pipe. The underside of the gripper bars 32 is provided with a smaller rectangular bar 42 from which extends a flat flange 44. The flange 44 extends at right angles to the face of the bar 42. The gripper bars or shoes are pivotally mounted by means of links with each gripper bar having two links 54 and 56. Each link has a bifurcate end 57. At one end of the bifurcate ends of the links 54 and 56 fit over the short flange 44 extending from the inner side of the gripper bars 32. The opening in the bifurcate ends of links 54 and 56 are only slightly larger than the thickness of plate or flange 44 to produce a relatively strong and rigid construction without wobbling of the gripper shoes. Each of the bifurcate ends 57 and the flanges 44 is provided with aligned openings to receive pins or rods 59 which are shown in the drawing as held in place by cotter pins 60 to pivotally mount gripper shoes or bars on links 54 and 56. If desired, washers can be used with the cotter pins 60. The one end of each of the rods 59 is preferably provided with a head of a larger size than the openings in the bifurcate ends 57 of the links 54 and 56. However, the rods 59 may have both ends with upset ends or heads to eliminate the use of cotter pins.

The other end of the set of links corresponding to the link 54 have their bifurcate ends 61 embracing or receiving lugs or upstanding members 62. The bifurcate ends 61 and lugs 62 are provided with aligned openings to receive a rod or pin 63 which may be similar to rod 59 above described for pivotally mounting links 54. The lug or upstanding member 62 is formed on the elongated cylinder 16 adjacent the one end near the abutment 18. The lug may be integrally formed with cylinder 16 or may be welded thereon to form a fixed member.

The other set of links corresponding to link 56 have their other end or the bifurcate end 65 pivotally attached to one end of the short sleeve 22 by means of pin or rod 74 which extends through aligned openings in the bifurcate end 65 and the ear or lug 75 formed integrally with or welded on the sleeve 22. The ear or lug 75 is provided on the sleeve 22 adjacent the end of the sleeve 22 near abutment 18.

Each of the links 54 in the one set in a lowered or collapsed position strikes against a stop 78 for preventing the gripper bars or shoes 32 to collapse flat or to such an extent that it is difficult to expand them again. Stop 78 is formed integrally with or welded to the outer wall of cylinder 16 adjacent the ear or lug 62 and spaced inwardly a short distance so that in collapsed condition each link 54 will strike its stop 78 above the bifurcate end 61 where the entire width of the link 54 will be used as a bearing surface.

The other set of links corresponding to link 56 also have similar stops or abutments 82 which are formed integrally with or welded on the sleeve 22. Abutments or stop 82 are arranged between lugs 75 and the adjacent end of sleeve 22 and like stops 78 are arranged so that the solid intermediate portion of link 56 strikes the lug 82 rather than the opening in the bifurcate end 65.

In operation, to collapse the expander tool shown in Fig. 1 it is necessary to hold the pulling ring 12 and to pull the release link 24 to the left. In this way the elongated cylinder 16 will abut against flange 14 and

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further movement of the release link 24 will cause movement of the short sleeve 22 to the left so that the links 56 and 54 flatten out and the gripper bars 32 are moved toward the sleeve 22 and cylinder 16 and are collapsed. When it is desired to use the tool to engage the inner walls of a pipe or tube, the puller ring 12 and rod 10 are pulled to the left while the release link 24 is held stationary and as the rod 10 is pulled to the left, abutment 18 engages the end of the elongated cylinder 16 to push the cylinder 16 to the left in Fig. 1. By holding the release link 24 and sleeve 22 stationary, the sets of links 54 and 56 and gripper shoes 32 will be expanded or raised to the position shown in Fig. 1 and the gripper shoes will be moved to such an extent until they contact the inner wall of the tube or pipe. The greater the force exerted on the puller ring 12, the tighter will be the grip of the gripper shoe 32 on the pipe. If desired, the gripper bars or shoes 32 may be provided with resilient material such as rubber or rubber-like material to prevent damage to the inner walls of the pipe or tube.

The expander tool of the present invention is adapted for use with pipes or tubing having an internal diameter between about 2 inches and 60 inches.

The expander tool device of the present invention can be made in different sizes to be used with different sized tubes or pipes. The expander tool may be used for removing pipes or tubes from furnaces or for pulling all sizes of pipes whether in laying new pipe or removing old pipe installations. Also it is useful for holding a pipe tube or casing in vertical position where the vertical pipe tube or casing is to be raised or lowered during construction. With the present tool the need for welding clips on torpedos for the crane hooks used in removing them is eliminated and the pipe puller tool of the present invention easily grips the torpedos for their removal.

The torpedos referred to are tubes fabricated with nozzles and used for the distribution of catalyst. They are fixed to baffle plates by press fits and also bolted for security. Usually they are about 2 to 3 feet long and when rendered ineffective due to erosion wear they are removed by a pulling action and replaced. The use of the expander tool would eliminate the need of welding clips for the pulling operation and greatly speed the repair of the equipment. The expander tool is also useful for handling or moving tubes or pipes to a desired place.

In a specific expander tool especially adapted for use in pulling pipes of about 10 inches diameter the puller rod 10 is about $\frac{3}{4}$ inch in diameter, the elongated cylinder 16 is about 1 inch in diameter and the short sleeve 22 is about $1\frac{1}{2}$ inches in diameter. The short sleeve 22 is about 8 inches long, the elongated cylinder 16 is about $15\frac{1}{2}$ inches long and the puller rod 10 is about 15 $\frac{3}{4}$ inches long. The gripper bars or shoes 32 are about 4 inches long, $1\frac{1}{2}$ inches wide and $\frac{5}{8}$ inch thick. The short flange 44 extending from the inner face of each gripper bar or shoe 32 is about $2\frac{1}{2}$ inches long, $\frac{1}{2}$ inch wide and about $\frac{1}{2}$ inch thick. The links 54 and 56 are about 4 inches long and about $\frac{3}{4}$ inches wide and about $\frac{7}{8}$ inch deep. The pins 59 and 63 of link 54 and also of the remaining links are about $\frac{5}{16}$ of an inch in diameter and are on about a $3\frac{1}{2}$ inch center to center measurement. The bifurcate end of the links such as 57 has a slot or opening about 1 inch long and about $\frac{1}{4}$ inch wide.

The diameter of the end flange 18 is about $1\frac{1}{2}$ inches. The ears or lugs 62 and 75 for the two sets of links are about 1 inch high, about $\frac{3}{4}$ inch wide and about $\frac{1}{4}$ inch in thickness to give a tight fit in the ends of the links. The stop lugs or abutments 78 and 82 are about $\frac{1}{2}$ inch high, $\frac{1}{2}$ inch wide and about $\frac{3}{8}$ inch thick.

With this specific device and with the tool expanded as shown in Fig. 1 the tool is useful for working on pipes of about 10 inches in diameter. Of course, the tool may also be use for pipes of a smaller diameter from

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about 8 inches up to 10 inches. For use with smaller diameter pipes the tool itself is made of smaller parts so that the device or tool when collapsed can be inserted into a smaller pipe or tube.

While one specific size of expander tool has been described it is to be expressly understood that this is by way of illustration only and various changes and modifications may be made without departing from the spirit of the invention.

What is claimed is:

1. A device of the character described including a puller rod having an abutment adjacent each end, an elongated cylinder slidably mounted on said puller rod between said abutments and concentric with said rod, said cylinder being shorter in length than the distance between said abutments to permit some movement of said cylinder on said rod, a sleeve of larger diameter and shorter length than said cylinder and slidably mounted thereon, a plurality of gripper bars adapted to grip the interior of a cylindrical object, means for pivotally mounting said gripper bars on said cylinder and sleeve, said means including a set of links pivotally mounted at their one ends to an end portion of said cylinder and at their other ends to said gripper bars and another set of links pivotally mounted at their one ends to an end of said sleeve adjacent said cylinder end portion and at their other ends to said gripper bars whereby relative movement of said cylinder and sleeve effects movement of said gripper bars.

2. A tube pulling device of the character described including a puller rod having an abutment adjacent each end, and elongated cylinder slidably mounted on said puller rod and concentric therewith, said cylinder being shorter in length than the distance between said abutments to permit some movement of said cylinder on said rod, a sleeve of larger diameter and shorter length than said cylinder and slidably mounted thereon, a plurality of gripper bars or shoes adapted to be inserted into the open end of and to grip the interior of a cylindrical object, said gripper bars or shoes being arranged at one end of said device, means for pivotally mounting said gripper bars or shoes on said cylinder and said sleeve, said means including a set of two links for each gripper bar or shoe, each link of a set being pivotally mounted at its one end to the underside of said gripper bar or shoe, the other end of one link of said set being pivotally mounted on said cylinder adjacent one end thereof and the other end of said other link of said set being pivotally mounted to the end of said sleeve adjacent said cylinder end whereby relative movement of said cylinder and said sleeve effects movement of said gripper bars or shoes.

3. An expander tool of the character described including a straight puller rod having an abutment adjacent each end, an elongated cylinder slidably mounted on said puller rod between said abutments and concentric with said rod, said cylinder being shorter in length than the distance between said abutments to permit some movement of said cylinder on said rod, a sleeve of larger diameter and shorter length than said cylinder and slidably mounted thereon, a plurality of gripper bars adapted to be moved outwardly from said puller rod to grip the interior of a cylindrical object and inwardly toward said puller rod to collapse said gripper bars, said gripper bars being arranged 90° apart, means for pivotally mounting each of said gripper bars on adjacent ends of said cylinder and said sleeve, said means including a set of two links for each gripper bar, each of said links of one set being pivotally mounted at its one end to one of said gripper bars, the other ends of each set of links being pivotally mounted, respectively, to adjacent ends of said cylinder and said sleeve, whereby relative movement of said cylinder and said sleeve in one direction effects expansion movement of said gripper bars and in said opposite direction effects collapse of said gripper bars.

4. An expansion tool according to claim 3 wherein

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said cylinder and said sleeve are provided with stops for each of said links to limit the collapsing movement of said gripper bars, said stops extending outwardly from said cylinder and said sleeve longitudinally intermediate the points on said cylinder and said sleeve whereat links of each set are pivotally mounted.

5. A tube pulling and holding device of the character described including a puller rod having an abutment adjacent each end, an elongated cylinder slidably mounted on said puller rod between said abutments and concentric with said rod, said cylinder being shorter in length than the distance between said abutments to permit some movement of said cylinder on said rod, a sleeve of larger diameter and shorter length than said cylinder and slidably mounted thereon, a plurality of gripper shoes arranged 90° apart and adapted to be inserted into an open end of and to grip the interior wall of a cylindrical object, each of said gripper shoes having a convex outer knurled face, means for pivotally mounting said gripper shoes on said cylinder and sleeve, lugs on said cylinder and arranged 90° apart adjacent one end of said cylinder, said means including one set of four links, each link being pivotally mounted at its one end to one of said lugs on

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said cylinder, a flange member extending inwardly substantially at right angles from the inner face of each of said gripper shoes, the other end of each of said four links being pivotally mounted to said flange member adjacent one end thereof, another set of four links each pivotally mounted at one end to said flange member adjacent the other end thereof, lugs on said sleeve and arranged 90° apart on the end portion of said sleeve adjacent that end of said cylinder where adjacent said first-mentioned lugs are arranged, the other end of each of said last-mentioned set of links being pivotally mounted on said sleeve lugs, whereby relative movement of said cylinder and sleeve effects movement of said gripper shoes, each of said links having bifurcate ends to fit over and embrace said lugs and said inwardly extending flange members, said sleeve being provided with a release ring at its end portion opposite to that end portion on which said sleeve lugs are arranged.

6. A device according to claim 2 wherein said cylinder has an internal diameter smaller than the outer dimension of each of said abutments.

No references cited.