Nov. 19, 1968 E. W. FORTUNE 3,411,748

BAND EXPANDER AND CONTRACTOR FOR DRAIN PIPES

Filed April 25, 1967 2 Sheets-Sheet 1

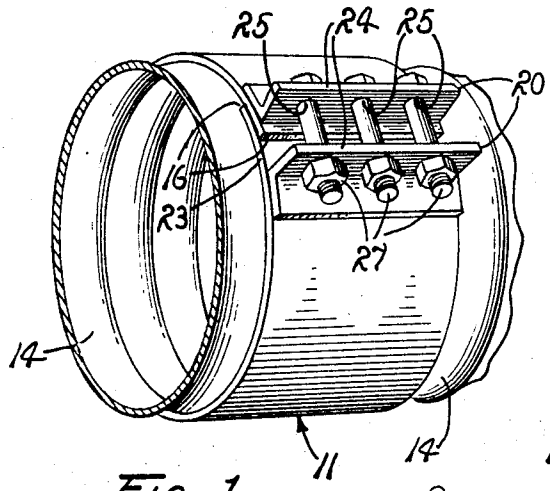


FIG. 1.

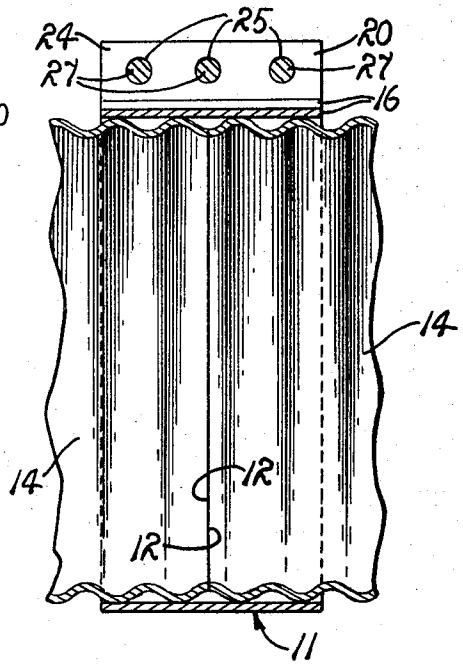


FIG. 2.

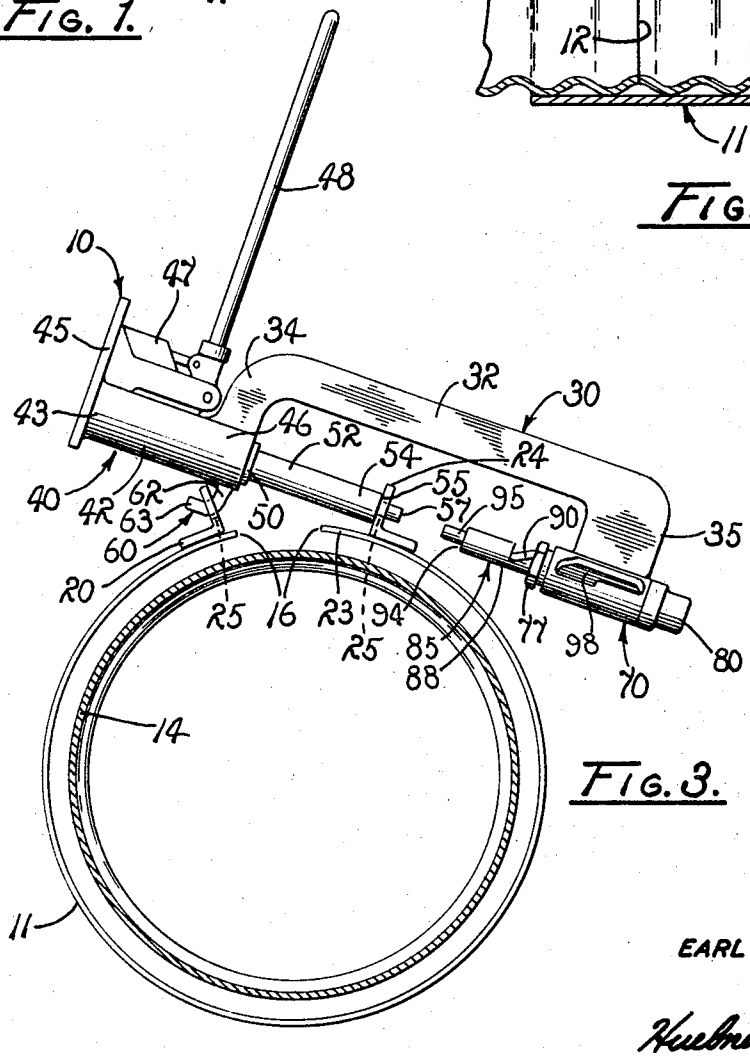


FIG. 3.

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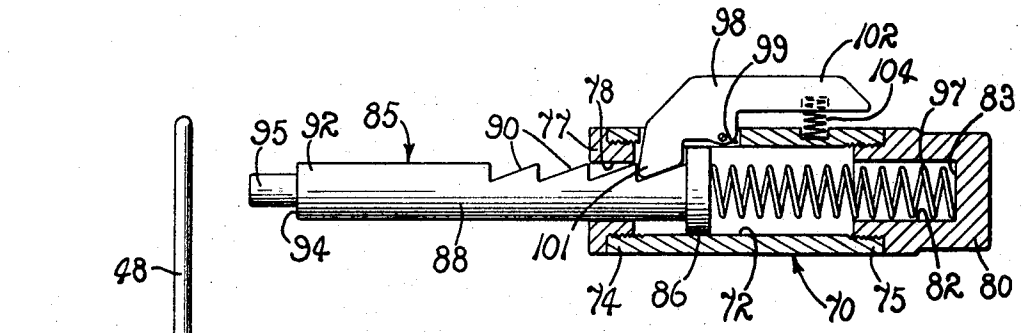


FIG. 5.

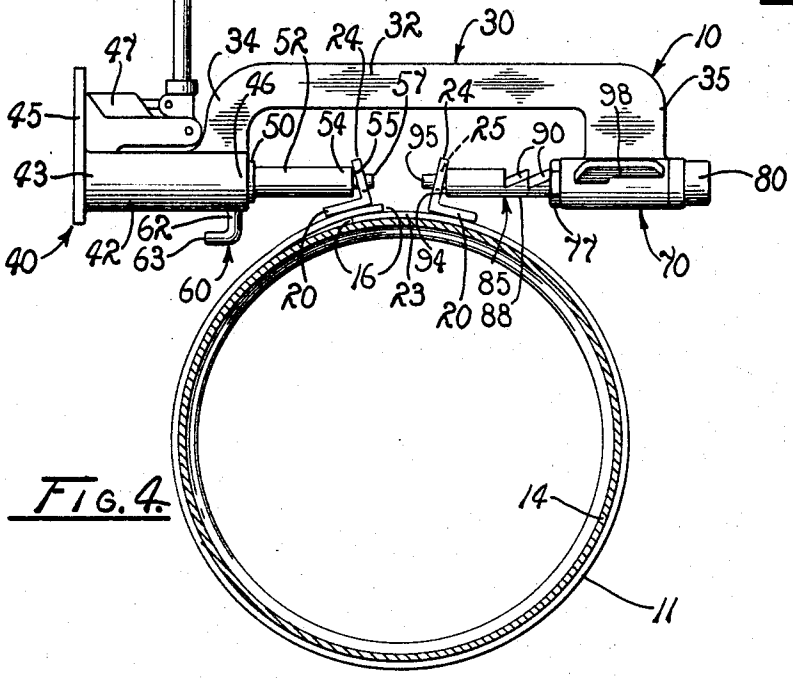


FIG. 4.

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BAND EXPANDER AND CONTRACTOR FOR DRAIN PIPES

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ABSTRACT OF THE DISCLOSURE

A tool for expanding and compressing the ends of substantially circular drain pipe clamping bands having a frame providing opposite ends individually mounting an extendible-retractable member and a reaction member for selective engagement with the ends of the bands. A second reaction member mounted on the frame at a position spaced from the extendible-retractable member in the opposite direction from the first reaction member for alternate selective engagement with a correspondingly opposite end of the band from the end engaged by said extendible-retractable member alternately to draw the ends toward each other and to spread them apart incident to extension of the extendible-retractable member.

Background of the invention

The relatively large diameter corrugated metal drain pipes employed as culverts beneath roadways and the like are usually adjoined at their adjacent ends by circular bands of correspondingly heavy gauged metal. The bands conventionally provide fasteners or ears of angle iron material which are individually spot welded adjacent to the opposing ends of the bands. Aligned bolt holes are formed in the ears to receive lock bolts therethrough to constrain the bands in tightly clamping relation about the adjacent ends of the drain pipes. The bands, being of such heavy gauged material, are frequently difficult to open sufficiently to permit initial installation about the abutting ends of the drain pipes and are similarly difficult to contract sufficiently to permit the installation of the locking bolts of a predetermined relatively short length through the ears. In the past, various mechanical devices have been employed to install the bands which have usually been cumbersome, clumsy and have required several workmen to hold the bands in the desired position and to effect the locking operation. Such devices must have a wide range of clamping movement and be readily adjustable between their maximum extreme positions since the ends of the bands are seldom spaced the same distance apart. These devices have, in the past, employed unwieldy screw-operated band engaging jaws and the like or removable chain fasteners which have not been fully effective for the purpose and have not been universally accepted. Accordingly, with the prior devices, the band expanding and compressing operations have been tedious to perform, and time-consuming, which has substantially added to the costs of installing such drain pipes. It was highly desirable, therefore, that a band expander and contractor for such drain pipes be developed which could be power-operated and easily handled by a single workman.

Accordingly, it is an object of the present invention to provide an improved band expander and contractor for installing such bands about relatively large, heavily gauged, corrugated metal drain pipes, culverts and the like.

Another object is to provide such an improved band expander and contractor which is adapted to be power-operated and conveniently handled by a single workman.

Another object is to provide a band expander and contractor of the character described which can be quickly and conveniently converted for either expanding or contracting such bands without requiring modification of the tool and without removing the tool from the immediate clamping area.

Another object is to provide an improved band expander and contractor which may be quickly and easily adjusted throughout a wide range to accommodate various spacing between the ends of the bands.

Another object is to provide an improved band expander and contractor which incorporates an hydraulic jack having a unidirectional power stroke utilized during both the band expanding and contracting operations.

Other objects and advantages of the present invention will subsequently become more clearly apparent upon reference to the following description and accompanying drawings.

Brief description of the drawings

FIG. 1 is a perspective of a clamping band disposed in constraining relation about the abutting ends of a pair of drain pipes showing the environment in which the tool of the present invention is used.

FIG. 2 is a somewhat enlarged fragmentary central longitudinal section through the clamping band and drain pipes of FIG. 1.

FIG. 3 is a side elevation of a band expanding and contracting tool embodying the principles of the present invention shown disposed in a band expanding position of the band.

FIG. 4 is a side elevation of the tool disposed in a contracting position on the band.

FIG. 5 is a somewhat enlarged central longitudinal section through the outer end of the tool.

Description of the preferred embodiment

Referring more particularly to the drawings, a band expanding and contracting tool embodying the principles of the present invention is generally indicated by the reference numeral **10**. The tool is adapted to be associated with a clamping band **11** for securing the ends **12** of a pair of heavy gauged corrugated metal drain pipes **14** in abutting relation. The band is constructed of similarly heavy gauged metal material and is constructed in substantially circular form providing opposite ends **16** normally disposed in somewhat spaced relation to each other prior to use. A pair of elongated ears formed by angle iron brackets **20** are individually secured to the outer periphery of the band closely adjacent to the ends as by spot welding or the like. As best shown in FIG. 3, one of the brackets is spaced from its respective end of the band farther than the opposite bracket to provide an extension **23** to provide an overlapping sliding connection with the opposite end of the band when contracted. Each of the angle irons provides a radially outwardly extended portion **24** through which is formed a plurality of bolt receiving holes **25**. A plurality of locking bolt and nut assemblies **27** are provided for extension through the holes **25** of the correspondingly aligned holes to hold the band in constraining position about the ends **12** of the drain pipes **14**.

The band expanding and contracting tool **10** of the present invention provides an elongated C-shaped frame **30** having an elongated substantially straight central portion **32** and opposite predetermined inner and outer ends **34** and **35**, respectively, substantially right-angularly related to the central portion. The frame is constructed of a substantially rigid lightweight metal material such as aluminum or the like with the central portion thereof providing a convenient gripping handle for transporting the tool.

A hand-actuated hydraulic jack **40** provides an elongated cylinder **42** having a lower end **43** mounted on an elongated substantially rectangular base **45** and an opposite upper end **46** rigidly secured, as by welding or the like, to the inner end **34** of the frame **30**. It is readily apparent, however, that the cylinder **42** and the frame **30** can be constructed integrally in the form of a single casting or the like. A jack actuating or pumping mechanism **47** is mounted on the base **45** adjacent to the cylinder **42** and beneath the frame **30** and includes an elongated operator's gripping handle **48**.

An elongated piston rod **50** is reciprocably mounted within the cylinder **42** of the hydraulic jack **40** and provides an outwardly extended portion **52** having a stepped distal end **54**. The distal end provides an annular stop shoulder **55** and a reduced diameter tip **57** of a diameter freely to be received through the holes **25** in the angle iron brackets **20** of the band **11**. The piston rod **50** is extendible from a retractable position into the cylinder **42** of the jack in spaced substantially parallel relation to the central portion **32** of the frame **30** upon manipulation of the handle **48** in the usual manner.

A band bracket engaging hook rod **60** provides an inner radially outwardly extended portion **62** secured, as by welding or the like, to the upper end **46** of the cylinder **42** of the hydraulic jack **40** in substantially diametrically opposed relation to the inner end **34** of the frame **30**. The hook rod includes a continuous outer arcuate portion **63** which is curved downwardly in spaced facing relation to the base **45** of the hydraulic jack. The hook rod is of a diameter freely to be received through the holes **25** of the brackets **20** with the inner portion **62** thereof providing a stop surface engageable with the brackets.

An elongated tubular housing **70** is mounted on the outer end **35** of the frame **30**, as by welding or the like, in spaced substantially coaxial relation to the cylinder **42** of the hydraulic jack **40**. As previously discussed with respect to the cylinder **42**, the housing **70** may also be cast integral with the frame as a manufacturing expedient, if desired. The housing includes an elongated cylindrical bore **72** having opposite inner and outer internally threaded ends **74** and **75**, respectively. A bushing **77** having a bore **78** therethrough is screw-threadably mounted in the inner end of the housing. A spring retaining cap **80** providing a bore **82** having a bottom **83** is screw-threadably mounted on the outer end of the housing.

An elongated clamping shaft **85** provides an enlarged circular head or stop portion **86** slidably disposed within the bore **72** of the housing and an elongated cylindrical body portion **88** slidably extendible and retractable through the bore **78** in the bushing **77**. The clamp shaft further includes a plurality of ratchet teeth **90** formed in the body thereof adjacent to the head portion **86** and an outer stepped end **92**. The stepped end provides an annular stop shoulder **94** and an outer tip **95** of a diameter freely to be received through the holes **25** in the brackets **20** of the band **11**. A compression spring **97** is disposed within the bore **72** of the housing between the head portion **86** of the clamp shaft **85** and the bottom **83** of the bore **82** in the cap **80** normally to urge the clamp shaft outwardly of the housing. A ratchet pawl **98** is pivotally mounted on the housing within an elongated opening **99** for holding the clamping shaft in its several axially adjusted positions. The pawl includes an inner tooth engaging end **110** and an opposite outer actuating end **102**. A compression spring **104** is mounted on the housing between the housing and the outer end of the pawl normally to urge the inner end thereof into engagement with the teeth **90** of the clamp shaft.

Operation

The operation of the described embodiment of the subject invention is believed to be clearly apparent and is briefly summarized at this point. Prior to use, the clamping band **11** may be in a diametrically expanded condition, as shown in FIG. 3. In such condition, the band is slipped over an end **12** of one of the drain pipes **14**. The other drain pipe is disposed in end-to-end relation to the previous drain pipe with their adjacent ends disposed in abutting relation, as shown in FIG. 2, and with the clamping band disposed in circumscribing symmetrically overlapping relation to the ends. As previously described, the band is constructed of such a heavy gauged metal to preclude manual contraction of the ends of the band toward each other for installation of the bolt and nut assemblies **27**. Accordingly, the band expanding and contracting tool **10** is utilized for effecting powered contraction of the ends of the band and to hold the band in such contracted condition during installation of the bolt and nut assemblies **27** for constraining the band about the ends of the drain pipes.

If the band **11** is initially disposed in a contracted condition prior to use, the band expanding and contracting tool **10** is first utilized to spread the ends **16** to permit slipping of the band over the end **12** of the pipe by inserting the hook **60** through one of the holes **25** in the brackets **20**. The handle **48** of the hydraulic jack **40** is actuated by the operator to extend the piston rod **50** from the cylinder **42**. During such extension, the central gripping portion **32** of the frame is held by the operator and the tip **57** of the piston rod guided into the hole **25** in the opposite bracket **20** of the band. Actuation of the handle of the jack is continued and the bracket **20** is engaged by the shoulder **55** on the piston rod so that further extension of the piston rod is effective to spread the ends **16** of the band away from each other. Such spreading of the ends of the band expands the diameter of the band to a size, as shown in FIG. 3, easily to be received in circumscribing relation about the ends **12** of the drain pipes **14**. After the band is disposed in the position shown in FIG. 2, the handle **48** is manipulated in the usual manner to permit retraction of the piston rod **50** into the cylinder **42**. Upon such retraction, the inherent resiliency of the band will tend to contract the band somewhat but usually such contraction is not sufficiently extensive to position the brackets close enough to permit extension of the bolt and nut assemblies **26** through the holes **25**.

In order to complete the installation of the band **11** about the ends **12** of the drain pipes **14**, the tool **10** is removed from the brackets **20** of the band **11** and with a minimum of manipulation is disposed to permit insertion of the tip **95** of the clamping shaft **85** through the hole **25** of the bracket **20** formerly occupied by the tip **57** of the piston rod **50**. As best shown in FIG. 4, the tool is positioned so that upon actuation of the handle **48** of the hydraulic jack **40**, the tip **57** of the piston rod is extended from the cylinder **42** until the tip **57** is inserted into the hole **25** formerly occupied by the hook **60**. Upon further actuation of the jack handle **48**, and extension of the piston rod, the ends **16** of the band are contracted in overlapping, tightly clamping, relation against the outer periphery of the drain pipes **14**. Such positioning is maintained by the tool until the bolt and nut assemblies **27** are installed through the remaining holes in the brackets. It is noted that such installation is easily accomplished without any undue strain or spreading force against the bolts by the use of the tool of the present invention which holds the band in its maximum contracted clamping position about the pipes.

It is noted that the tool is effective through a wide range of movement depending upon the particular spacing of the ends **16** of the band **11**. As best shown in FIG. 5, the clamping shaft **85** is disposed in its maximum extended position from the housing **70**. If a band having more widely spread ends is encountered, the outer end **102** of the pawl **98** is depressed toward the housing in order to lift its inner end **110** out of engagement with the teeth **90** on the clamping shaft. Accordingly, the clamping shaft may then be retracted inwardly of the housing to the desired position after which the pawl is released to

engage the appropriate tooth so as to prevent further inward movement of the clamping shaft. It is noted that the spring **97** is not sufficiently strong to overcome the force of the pawl spring **104**. When it is desired to re-extend the clamping shaft, an outward pulling force is exerted thereon sufficient to overcome the force of the pawl spring with the inner end thereof ratcheting over the teeth **90** of the clamping shaft.

In view of the foregoing, it is readily apparent that the structure of the present invention provides an improved band expanding and contracting tool which is quickly and easily converted for both operations with a minimum of manipulation of the tool relative to the band. The tool is effective during such expanding and contracting operations through the utilization of a powered hydraulic jack having a uni-directional power stroke utilized during both operations. Furthermore, the tool is readily adapted to a wide range of spacings of the ends of the bands and such adjustment is easily accomplished with a minimum of effort and without special adjusting tools.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom, within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A tool for expanding and contracting the ends of substantially circular drain pipe clamping bands comprising a frame, force applying means on the frame having a uni-directionally powered end alternately selectively engageable with said ends of the band, and a pair of reaction members individually mounted on the frame at positions oppositely spaced from said powered end of the force applying means for alternate selective engagement with a correspondingly opposite end of the band from the end engaged by said powered end of the force applying means alternately to draw the ends toward each other and to spread them apart during uni-directional movement of said powered end of the force applying means.

2. The tool of claim **1** in which said frame has opposite ends; one of said reaction members mounted on one end of said frame, and the other reaction member mounted on the opposite end of the frame, and said uni-directionally powered end of the force applying means disposed adjacent to said one end of the frame for extension toward said reaction member on said opposite end of the frame and away from the reaction member on said one end of the frame.

3. The tool of claim **2** in which said frame provides predetermined inner and outer ends, said force applying means comprising an elongated piston rod, an hydraulic cylinder mounting said rod on said inner end of the frame, one of said reaction members comprising an elongated shaft, a tubular housing mounting said shaft on the outer end of the frame in spaced coaxial relation with said piston rod, and manipulatable means on the housing for preliminarily axially adjustably positioning the shaft with respect to the housing and to said piston rod.

4. The tool of claim **3** in which said manipulatable means comprises a ratchet connection between said shaft and the housing to permit outward extension of said shaft from the housing toward said rod to adjust the spacing therebetween and permitting inward travel of the shaft into the housing only upon manipulation of the ratchet.

5. A tool, for expanding and contracting a substantially circular band having opposite ends mounting connecting ears adapted to receive locking bolts therethrough for holding the band in interconnecting tightly clamping relation about the abutting ends of a pair of drain pipes, comprising an elongated C-frame having opposite inner and outer ends, a powered cylinder mounted on the inner end of the frame providing a base for the tool; a piston rod reciprocably mounted in the cylinder disposed in spaced substantially parallel relation to said straight portion of the frame and having a stepped end providing an annular shoulder on the rod; an arcuately curved hook mounted on the cylinder in diametrically opposed relation from the inner end of the frame and providing an end extended toward said base of the tool for insertion through one of the ears on the band upon insertion of said stepped end of the rod through the opposite ear to spread the opposite ends of the band incident to extension of the rod from the cylinder; a tubular housing mounted on said outer end of the frame; and an axially adjustable clamping shaft disposed within the housing in spaced substantially coaxial relation to said rod and having a stepped end insertable through one of said ears of the band in opposed relation to the rod when the rod is extended through the opposite ear of the band to draw the ears toward each other incident to extension of the rod from the cylinder for holding the band in tightly clamping relation about the pipes to permit installation of the locking bolts through the ears.

6. The tool of claim **5** in which said clamping shaft has a plurality of ratchet teeth formed therein, a pawl pivotally mounted on the housing and having an inner tooth engaging end and an opposite actuating end, biasing means disposed within the housing to urge said shaft outwardly from the housing incident to releasing said pawl from the ratchet teeth, and stop means to preclude complete removal of the shaft from the housing.

References Cited

UNITED STATES PATENTS

2,784,937	3/1957	Lefke	254—50.3
2,947,275	8/1960	Edmonds	254—51 X
3,108,783	10/1963	Foust et al.	254—67
3,341,178	9/1967	Cott	254—79

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