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Dunbar

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[54] **HYDRAULIC LINE ASSEMBLY**

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[52] **U.S. Cl.** **137/615;** 137/355.17
[51] **Int. Cl.** **B65h 75/36**
[58] **Field of Search**..... 137/355.16, 355.17, 355.18, 137/355.19, 355.20, 355.22, 355.23, 355.24, 137/355.25, 355.26, 355.27, 355.28, 615, 344; 285/133, 134; 239/165

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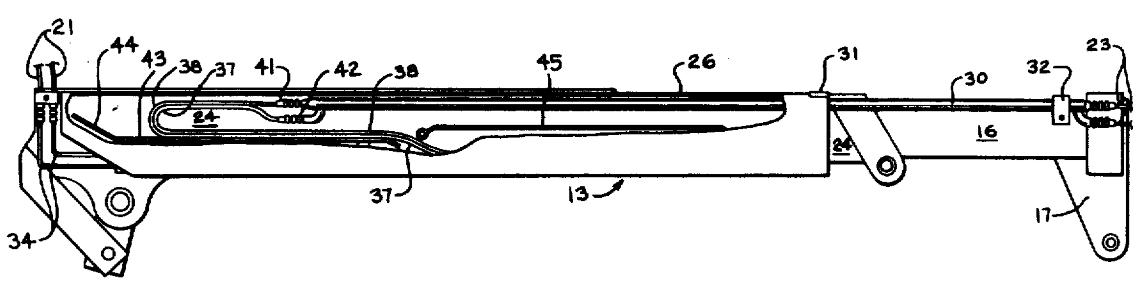
[57] **ABSTRACT**

A hydraulic tube and hose assembly for use on a crane having a telescoping boom. The assembly includes a coaxial hydraulic conduit mounted for travel with the extending arm of the boom and slidably connected to the non-extending portion of the boom. The coaxial conduit is of a length greater than the throw of the telescoping boom, so that upon extension of the telescoping arm, the conduit travels along with an generally parallel to the arm. The forward end of the coaxial hydraulic conduit is connected to a hydraulically operated implement mounted on the end of the boom, while the rearward end of the conduit is connected to a pair of flexible hydraulic lines leading to a stationary portion of the crane and ultimately to a hydraulic fluid supply. The flexible hydraulic lines define a curve of 180° which migrates during extension of the boom from a rearward position adjacent the end of the conduit to a forward position adjacent a line divider guide, thereby reducing the probability of injury to the hydraulic line and providing a determined course of travel for the hydraulic line during extension and retraction of the boom.

6 Claims, 9 Drawing Figures



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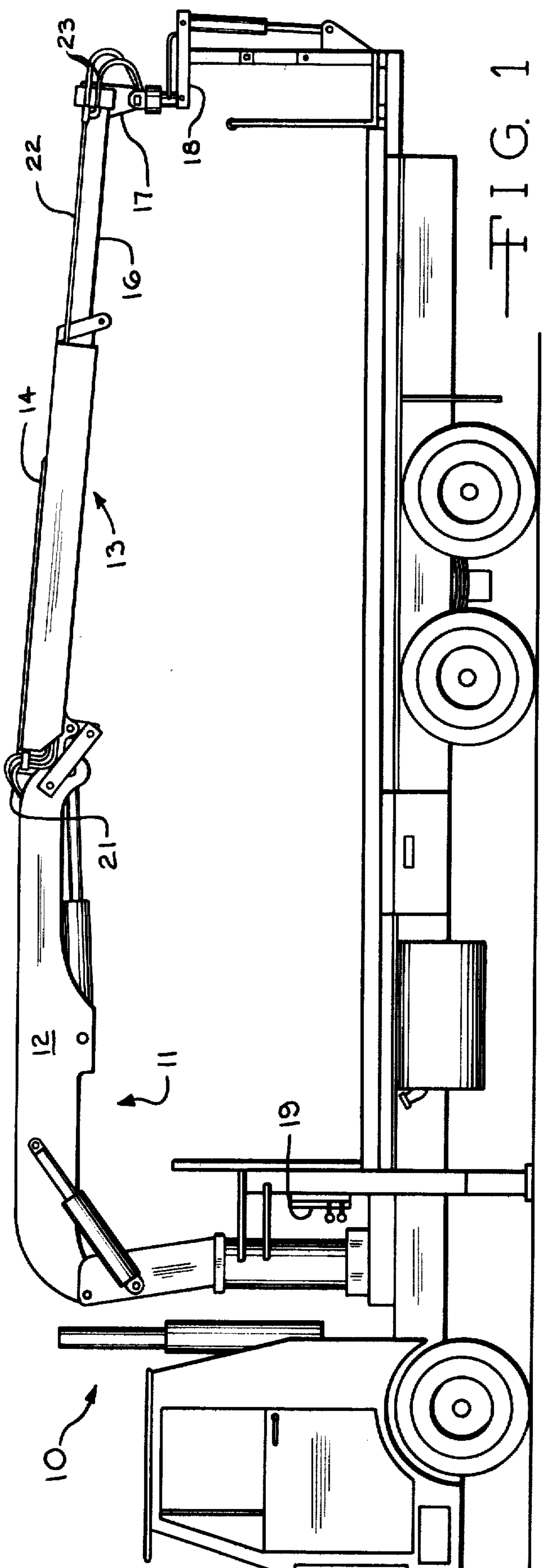

FIG. 1

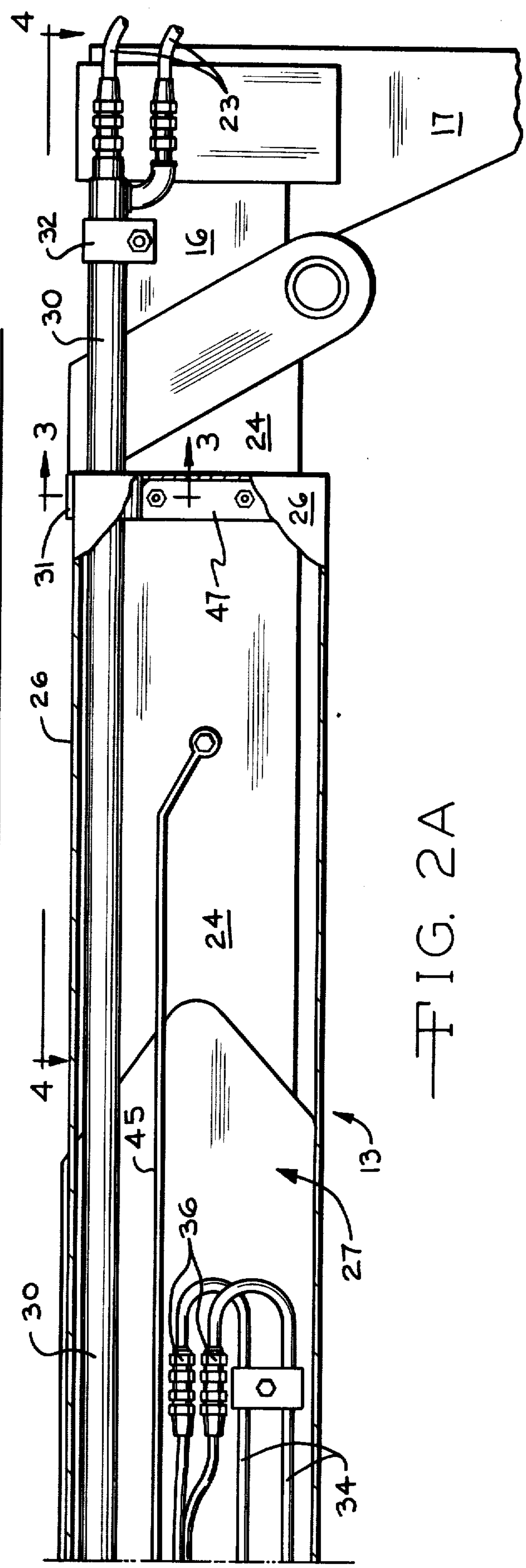

FIG. 2A

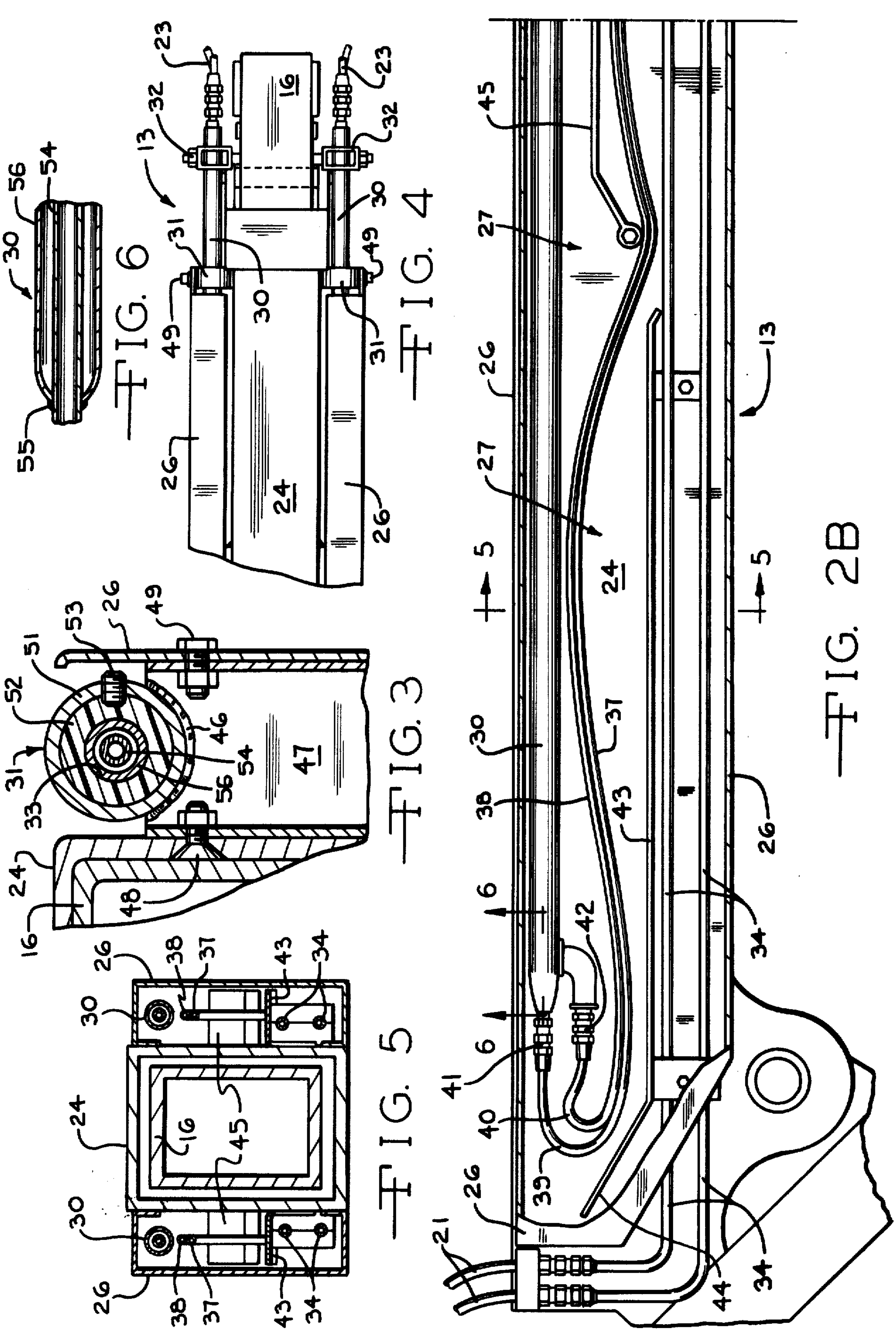

FIG. 2B FIG. 3 FIG. 4 FIG. 5 FIG. 6

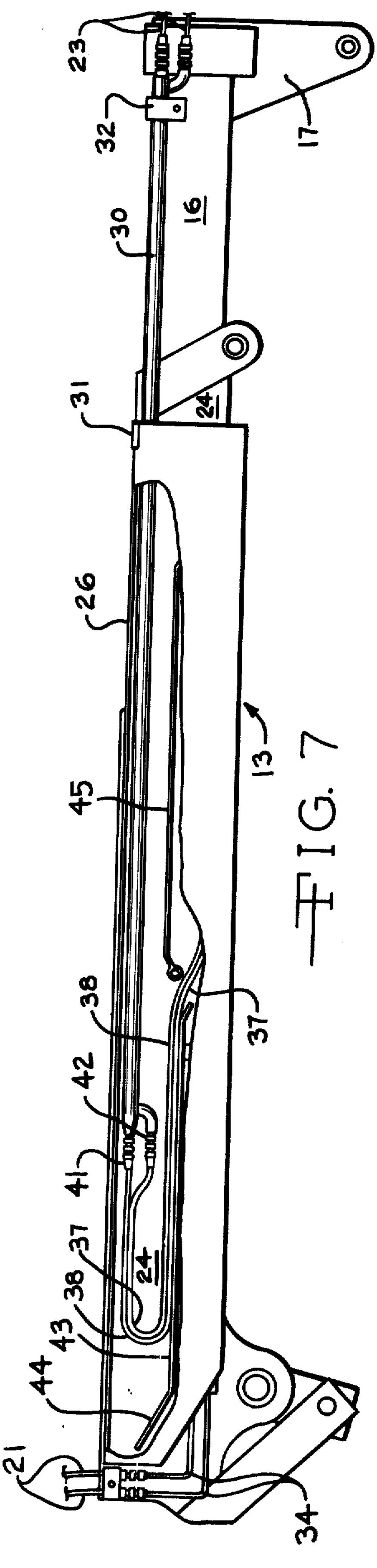

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FIG. 7

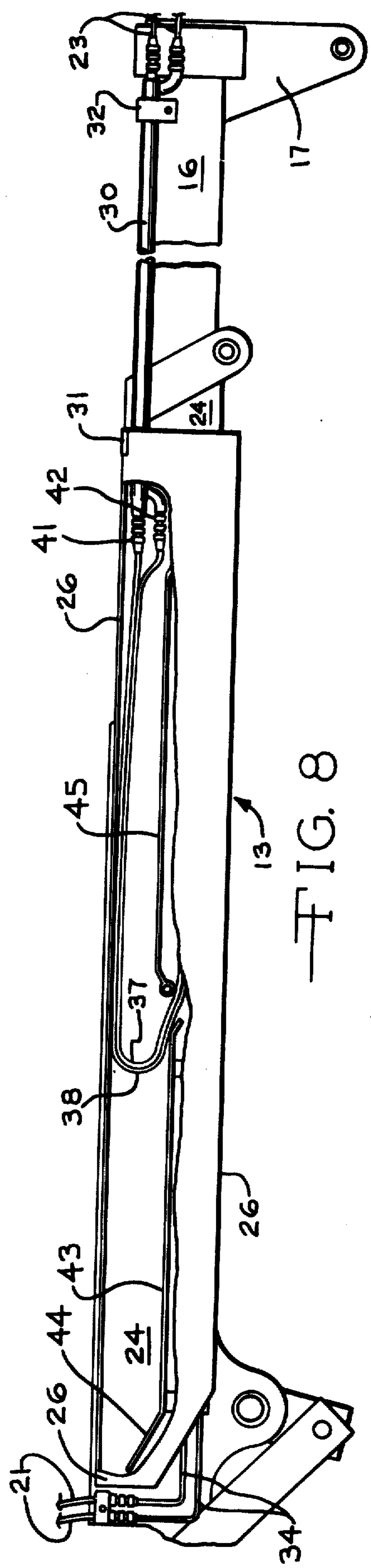

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FIG. 8

HYDRAULIC LINE ASSEMBLY

BACKGROUND OF THE INVENTION

The invention relates to construction or other equipment having an extendable outer arm and more particularly to cranes having telescoping booms to which are mounted hydraulically operated equipment.

Cranes with telescoping booms which carry hydraulically operated implements generally employ flexible fluid lines to connect the hydraulic implements with a stationary hydraulic supply, for example, a hydraulic fluid pump. The lines traversing the telescoping boom must be of sufficient length to accommodate the fully extended telescoping arm. When the arm is partially or fully retracted, however, excess line is accumulated. Because the line cannot be allowed to hang loosely below the boom and catch on objects when the crane is in use, excess line must be stored somewhere in or on the boom. Existing storage arrangements generally result in wear and ultimate breaks in the flexible lines. This is due in part to the fact that the lines must slide along the non-extending portion of the boom in order to feed the extending arm and in part to the inevitable doubling up and rubbing of the line in various places along the line storage area as the boom is retracted.

In addition, the flexible lines on the extended telescoping arm are subjected to damage by contact with, for example, boxes or other objects being transferred by the crane implement.

SUMMARY OF THE INVENTION

The present invention provides a telescoping boom hydraulic line assembly which reduces problems of line wear and breakage inherent in many prior art line arrangements. The assembly includes a storage chamber defined along the non-extending portion of the telescoping boom. Rigid hydrualic lines from a hydraulic source extend the majority of the length of the chamber, terminating in fittings aimed rearwardly. Flexible lines lead from these fittings to a connection at the rearward end of a rigid coaxial hydraulic conduit pipe.

In the telescoping boom's retracted position, the coaxial conduit pipe extends substantially through the length of the storage chamber, through a slide mounting at the forward end of the chamber, and to the end of the telescoping arm of the boom, where it is rigidly mounted. From here, flexible lines connect the conduit with the hydraulically operated implement at the end of the boom.

In the retracted position of the boom, a gradual **180°** bend is formed in the flexible line adjacent its connection with the rigid coaxial conduit. As the arm is telescoped forward, this bend advances forward at half the rate of the arm, taking up line which has previously been lying at rest in the storage chamber. When the boom is fully extended, the position of the bend is approximately mid-way along the length of the storage chamber. To prevent rubbing together of portions of the flexible line as the conduit approaches its full forward position, a longitudinally extending guide shield mounted within the chamber prevents the upper portion of the folded flexible lines from contacting the lower portion. The hydraulic tube and line arrangement of the present invention thus minimizes contact between portions of the flexible line, minimizes sliding contact of the lines with the storage chamber, and provides a rigid, slidably mounted tubular conduit where the lines must extend forward to accommodate the movement of the telescoping arm of the boom. Minimum friction is generated during extension and retraction of the telescoping boom.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an elevational view of a truck mounted crane with a telescoping boom employing apparatus according to the present invention;

FIG. **2***a* is the right half of an enlarged, partially broken away view of the telescoping boom of FIG. **1**;

FIG. **2***b* is the left half of the same enlarged view;

FIG. **3** is a sectional view taken along the line **3—3** of FIG. **2***a;*

FIG. **4** is a fragmentary plan view taken along the line **4—4** of FIG. **2***a;*

FIG. **5** is a sectional view taken along the line **5—5** of FIG. **2***b;*

FIG. **6** is a sectional view of a coaxial conduit taken along the line **6—6** of FIG. **2***b;*

FIG. **7** is a cut away view of the telescoping boom partially extended; and

FIG. **8** is a cut away view of the telescoping boom fully extended.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1** of the drawings, a truck **10** is indicated having a crane mechanism generally indicated by the reference number **11**. The crane **11** includes a first pivotal boom **12** to which is connected a telescoping boom **13**. The telescoping boom **13** includes a base or non-extending portion **14** and a telescoping arm **16**. On the arm **16** is an end **17** to which is attached a hydraulically operated implement **18**. Hydraulic controls **19** regulate the flow of hydraulic fluid from a hydraulic supply including well known pumps and reservoirs (not shown). The hydraulic fluid passes through hydraulic lines **21**, **22**, and **23** to the implement **18**.

Referring now to FIGS. **2***a* and **2***b*, the telescoping boom is shown in an enlarged, detailed view. A boom housing **24** receives the telescoping arm **16**. Mounted to the side of the boom housing **24** is an outer housing **26** which defines a storage chamber **27**.

FIGS. **2***a* and **2***b* show the telescoping boom **13** in its fully retracted position. In such position, a coaxial hydraulic conduit **30** extends from the rearward end of the chamber **27** through the length of the chamber **27** and through a slide bearing **31** to a fixed connection **32** on the telescoping arm **16**. As the telescoping arm **16** is extended, the coaxial conduit **30** slides through the slide bearing **31**, which preferably has a lubricated bearing surface **33**, best seen in FIG. **3**. A pair of rigid hydraulic lines **34** lead from external hydraulic lines **21** through the greater part of the length of the chamber **27**, bend **180°** to a rearward direction, and terminate in fittings **36**. Connected to the fittings **36** are flexible hydraulic lines **37** and **38** which are preferably attached to one another. In the fully retracted position of the telescoping boom as indicated in FIGS. **2***a* and **2***b*, the flexible lines **37** and **38** extend back substantially linearly, then through **180°** curves **39** and **40** to fittings **41** and **42** on the coaxial conduit **30**. A guide shield **43** having an angled rearward leg **44** provides boundaries of the area in which the flexible lines **37** and **38** may rest.

FIG. 7 indicates the positions of the conduit **30** and the lines **37** and **38** as the telescoping arm **16** of the boom **13** is extended forward. The bends **39** and **40** in the flexible lines **37** and **38** advance forward in the storage chamber **27** at one-half the rate of advancement of the conduit pipe **30** and telescoping arm **16**. Sliding friction between the lines **37** and **38** and the stationary portions of the storage chamber **27** is minimized. A forward longitudinally-extending line guide shield **45** provides a divider between the upper portions of the outfolded flexible lines **37** and **38** and their lower portions, thus minimizing friction between portions of the lines themselves.

FIG. **8** shows the conduit **30** and flexible lines **37** and **38** in the fully extended position of the telescoping arm **16**. The bends **39** and **40** in the flexible lines **37** and **38** have advanced to a position adjacent the end of the forward guide shield **45**, and the major portions of the lines **37** and **38** lie in substantially linear position above the shield **45**. Some friction is encountered as the lines **37** and **38** are drawn over the line guide **45**, but this friction is minimal.

FIG. **4** shows a portion of the telescoping boom **13** in plan view, indicating that hydraulic line assemblies according to the present invention may be mounted on both sides of the telescoping boom **13**, when additional hydraulic lines are needed to operate equipment mounted on the end of such a boom. On both sides of the boom housing **24** would be an outer housing **26**, a coaxial hydraulic conduit **30**, a connection **32** to the telescoping arm **16** and a slide bearing **31**.

FIG. **5** also indicates, in section, a telescoping boom **13** having dual hydraulic line assemblies. Outer housings **26**, coaxial conduits **30**, line storage chambers **27**, hydraulic lines **37** and **38**, and line guide shields **43** and **45** are shown on both sides of the boom housing **24**.

FIGS. **3** and **6** show details of construction of the slide bearing **31** and the coaxial hydraulic conduit **30** which slides within the bearing **31**. The bearing **31** is preferably welded to a form fitted slot **46** in a length of channel **47** and is mounted to the boom housing **24** by means of bolts **48**. Bolts **49** connect the outer housing **26** to the opposite flange of the channel **47**. The bearing **31** comprises an outer sleeve **51** and an inner sleeve **52** defining the lubricated inner bearing surface **33** which guides the coaxial conduit **30**. A set screw **53** retains the inner sleeve **52** within the outer sleeve **51**. As seen in FIGS. **3** and **6**, the coaxial conduit **30** comprises an outer tube **56** and an inner tube **54**, which are sealed at points **55**.

The above described preferred embodiment provides a hydraulic line assembly which minimizes wear on hydraulic lines leading to hydraulically operated implements at the end of a telescoping boom. The assembly is simple, economical to manufacture and virtually trouble free. Various other embodiments and alterations to this preferred embodiment will be apparent to those skilled in the art and may be made without departing from the spirit and scope of the following claims.

What I claim is:

1. A hydraulic line assembly for use on an extensible boom having a fluid supply source, a non-extending base section and a movable arm section extending outwardly from said base section, said assembly comprising,

a rigid conduit assembly having at least two independent fluid transfer conduits, said rigid conduit assembly having its forward end attached adjacent the forward end of such movable arm and its rearward end slidably mounted on such base section,

a plurality of flexible conduits positioned adjacent such base section, said flexible conduits having forward ends attached to and in fluid communication with said independent fluid transfer conduits, their other ends being in communication with the fluid supply source, and

a housing positioned on the exterior of the non-extending base section, said housing defining a chamber for receiving said flexible conduits and stationary divider means mounted within said housing for maintaining separation between portions of said flexible conduits during extension and retraction of the movable arm.

2. A hydraulic line assembly according to claim **1** wherein said stationary divider means commprises a longitudinally extending shield having a first end connected to said non-extending base section and within said housing and a second end spaced from said first end whereby said shield separates folded portions of said flexible conduit within said housing.

3. The hydraulic assembly of claim **2**, including guide means for slidably retaining said rigid conduit assembly adjacent said base portion, said guide means comprising a bearing rigidly mounted to said non-extending base section, said bearing slidably receiving said rigid conduit assembly.

4. The hydraulic line assembly of claim **2** wherein said rigid conduit, in a fully retracted position of the movable arm, extends approximately the length of the base portion.

5. Apparatus according to claim **2** wherein said rigid conduit comprises concentric tubes.

6. The apparatus according to claim **2** wherein said plurality of flexible conduits are bound together substantially throughout their length.

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