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Cegielski

[11] **3,920,071**

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[54] **WELL APPARATUS**

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[52] **U.S. Cl.** **166/182;** 166/85; 166/208

[51] **Int. Cl.²** **E21B 23/06;** E21B 33/035

[58] **Field of Search** 166/83, 85, 86, 87, 88, 166/237, 123–125, 181, 182, 208; 285/39, 142

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Attorney, Agent, or Firm—W. F. Hyer; Marvin B. Eickenroht

[57] **ABSTRACT**

Well apparatus is disclosed wherein a tool for lowering one member into a landed position with respect to another member within a wellhead bore is automatically released from the one member for removal from the wellhead bore during lowering of the one member into such landed position.

20 Claims, 8 Drawing Figures

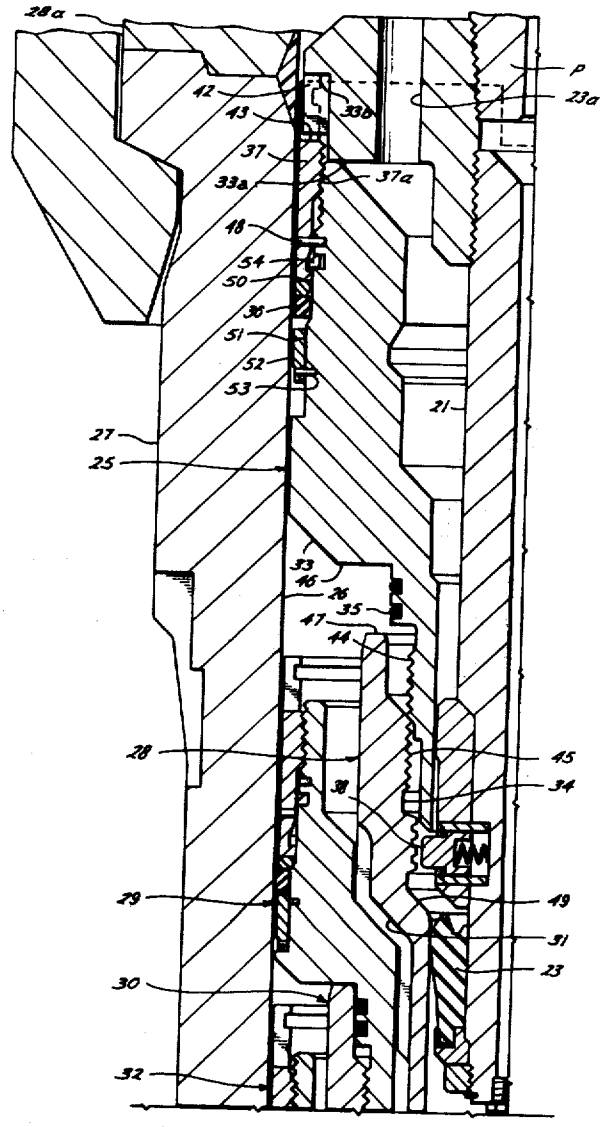
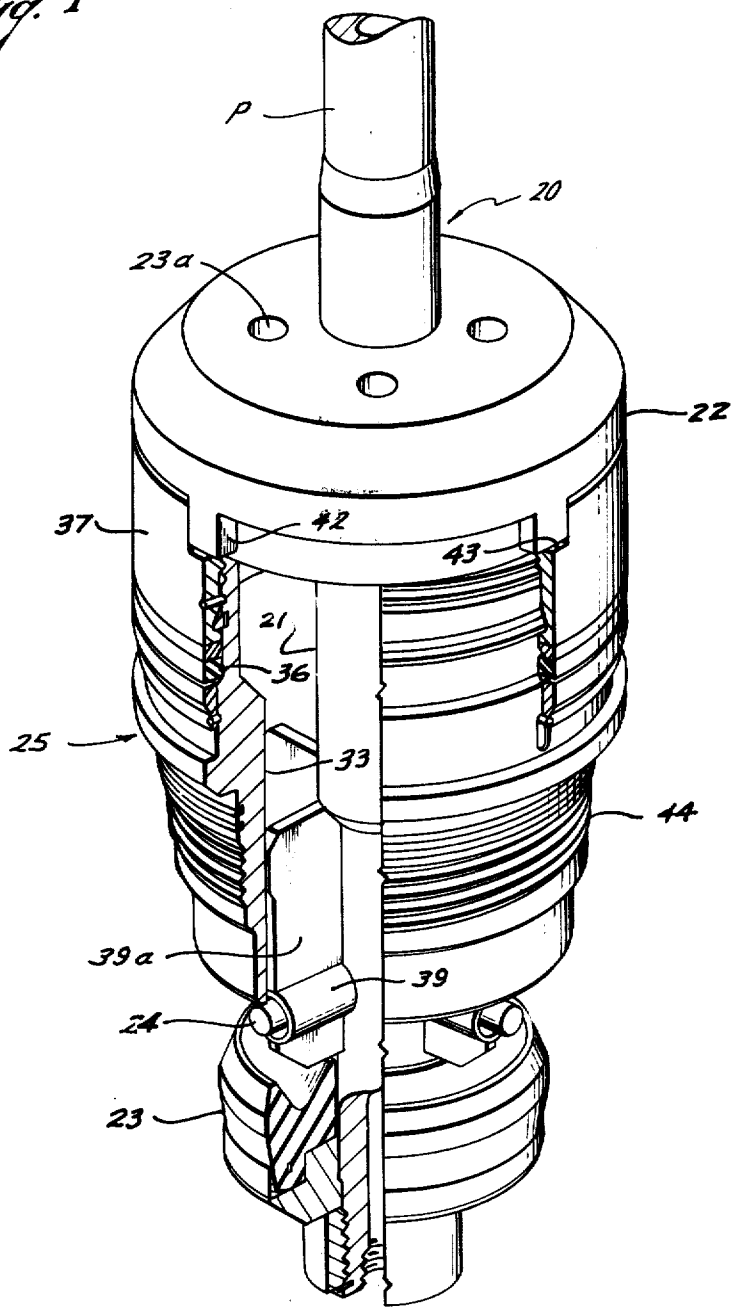
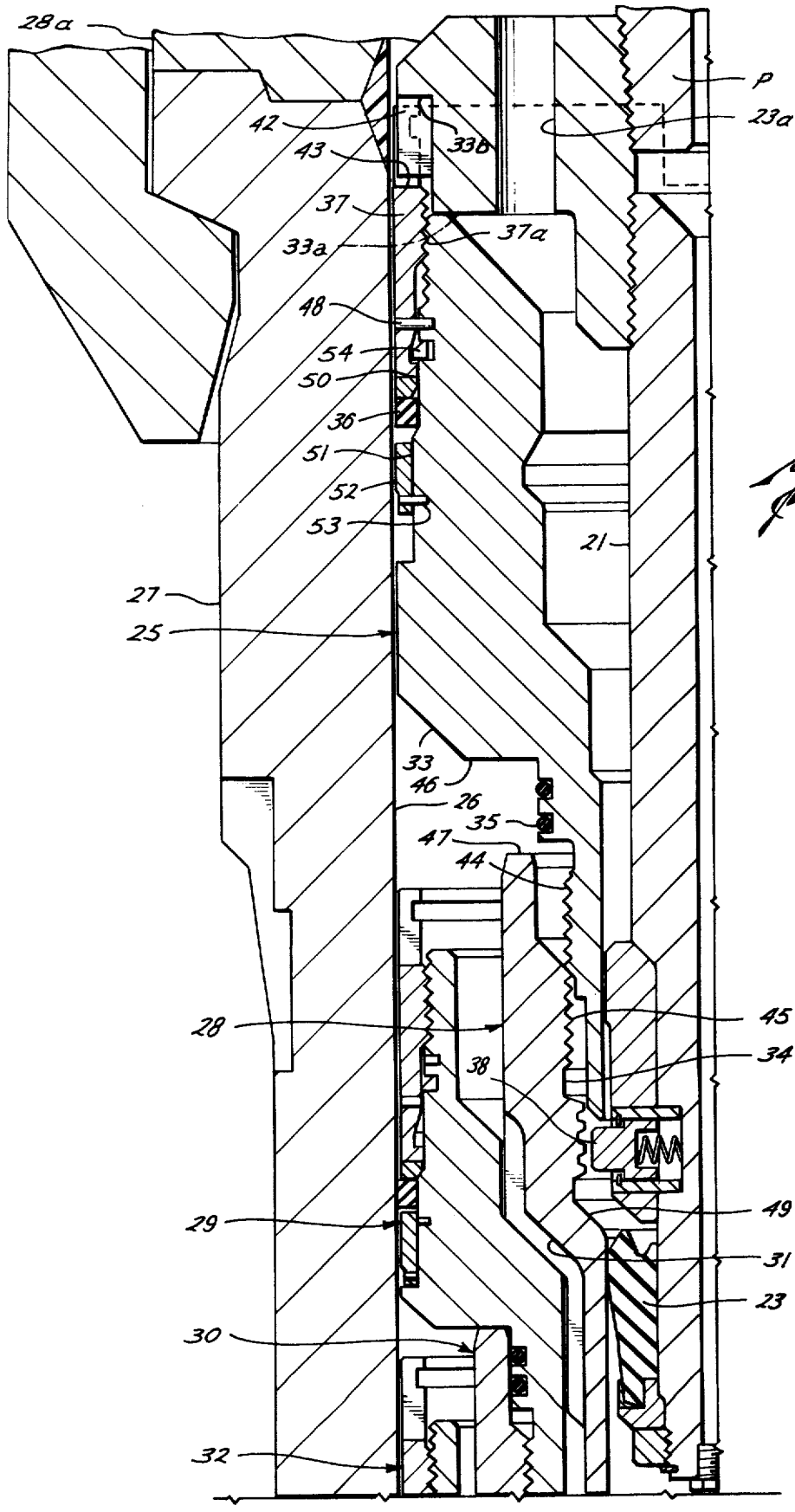


Fig. 1




28a
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23a
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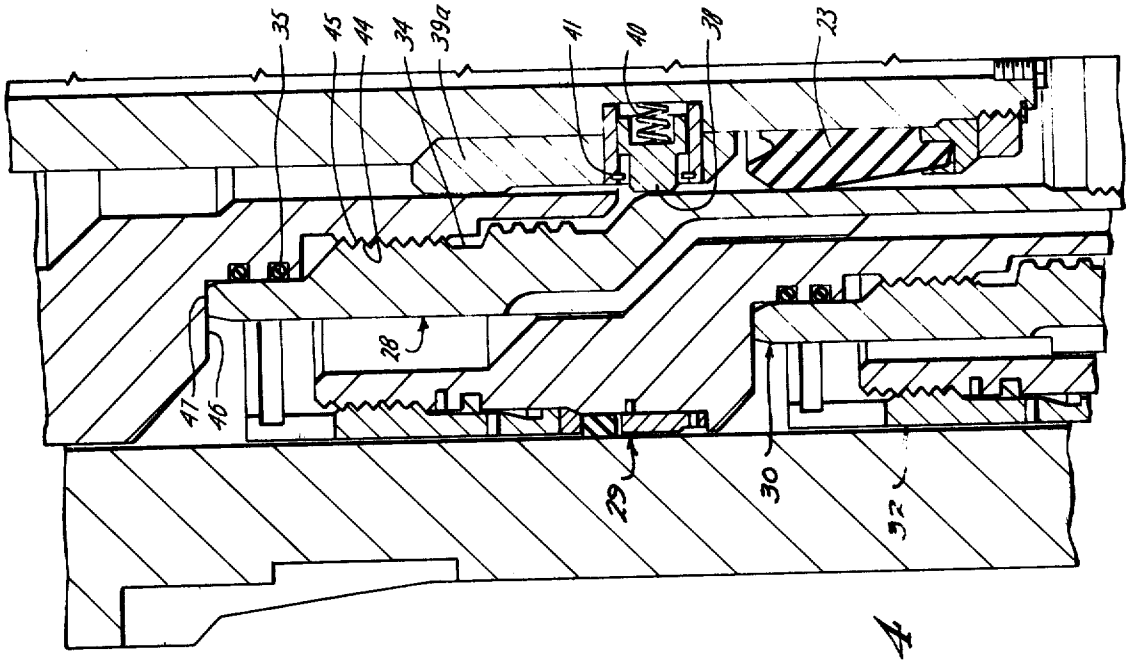
Fig. 2


35
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44
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39a
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Fig. 4

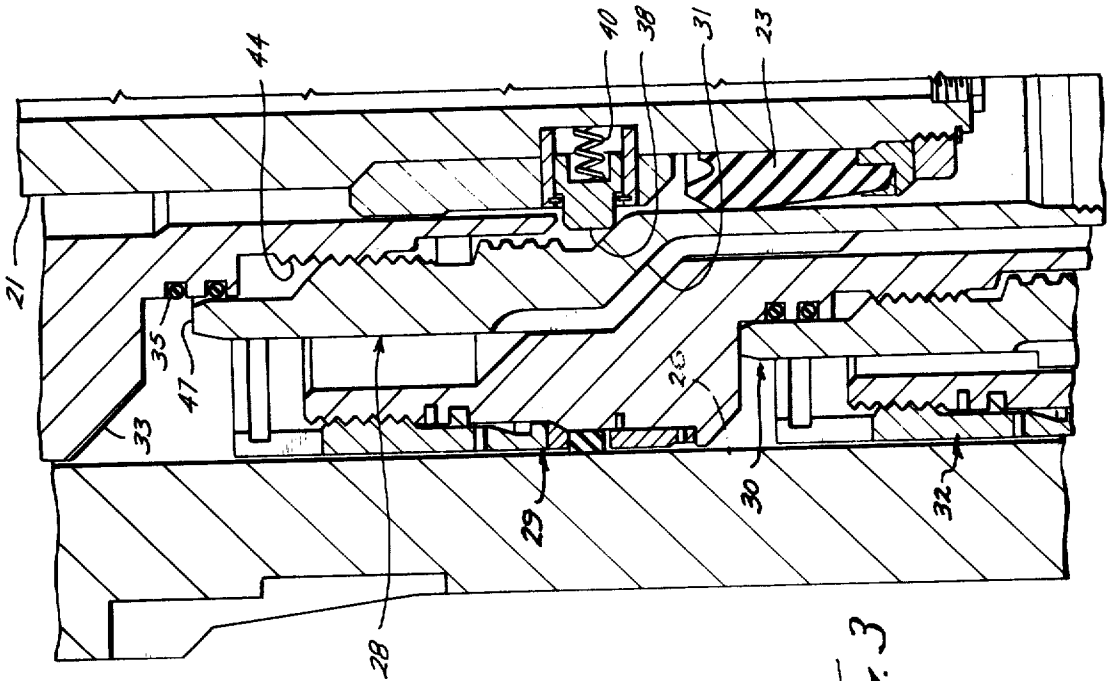
44
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Fig. 3

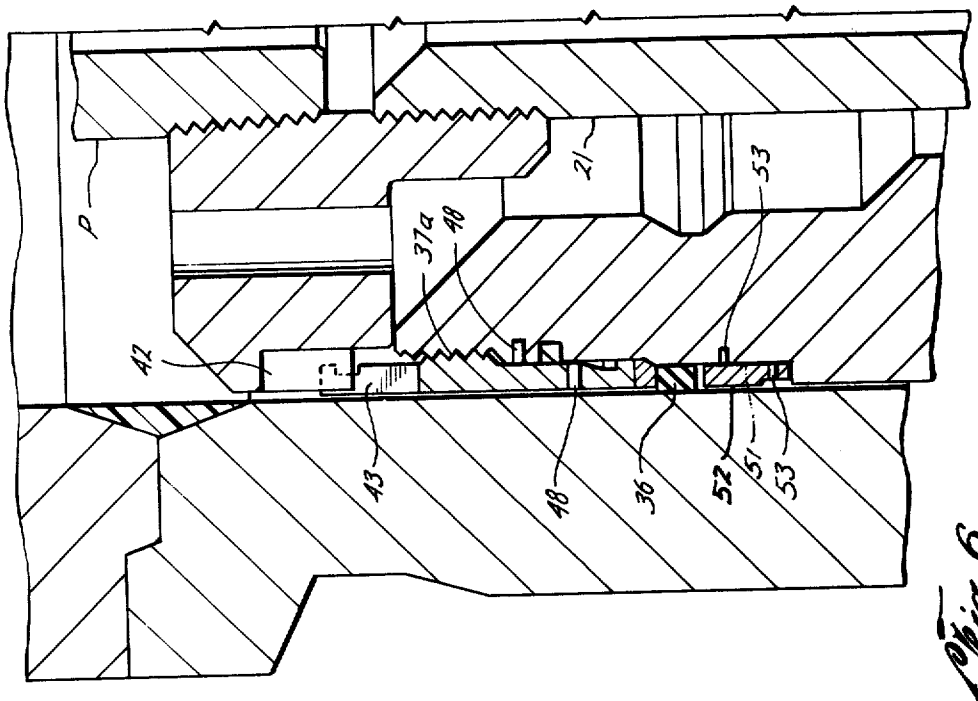

Fig. 6

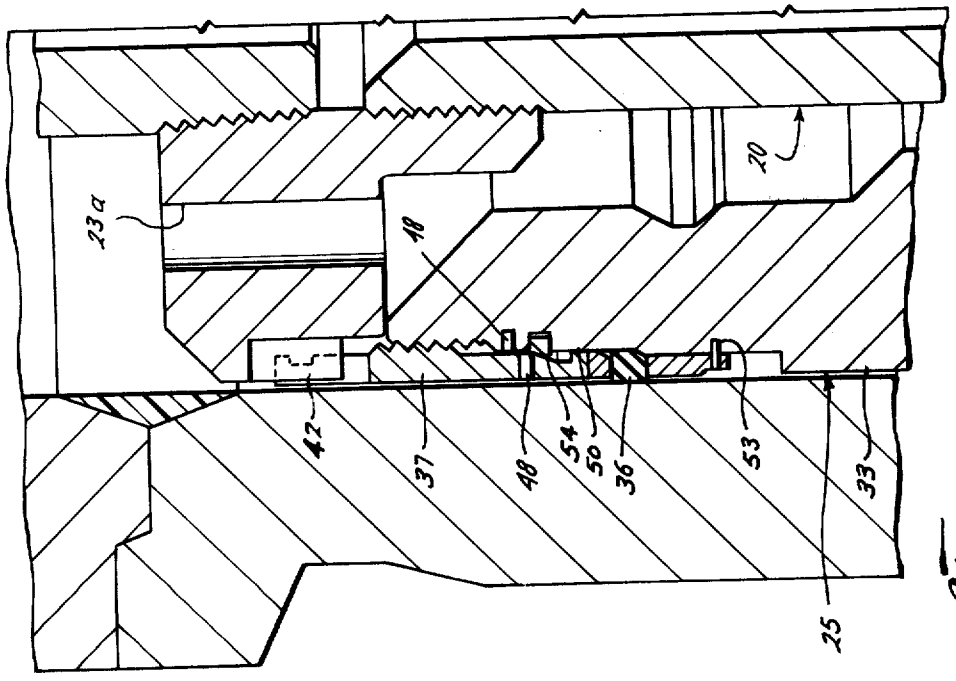

Fig. 5

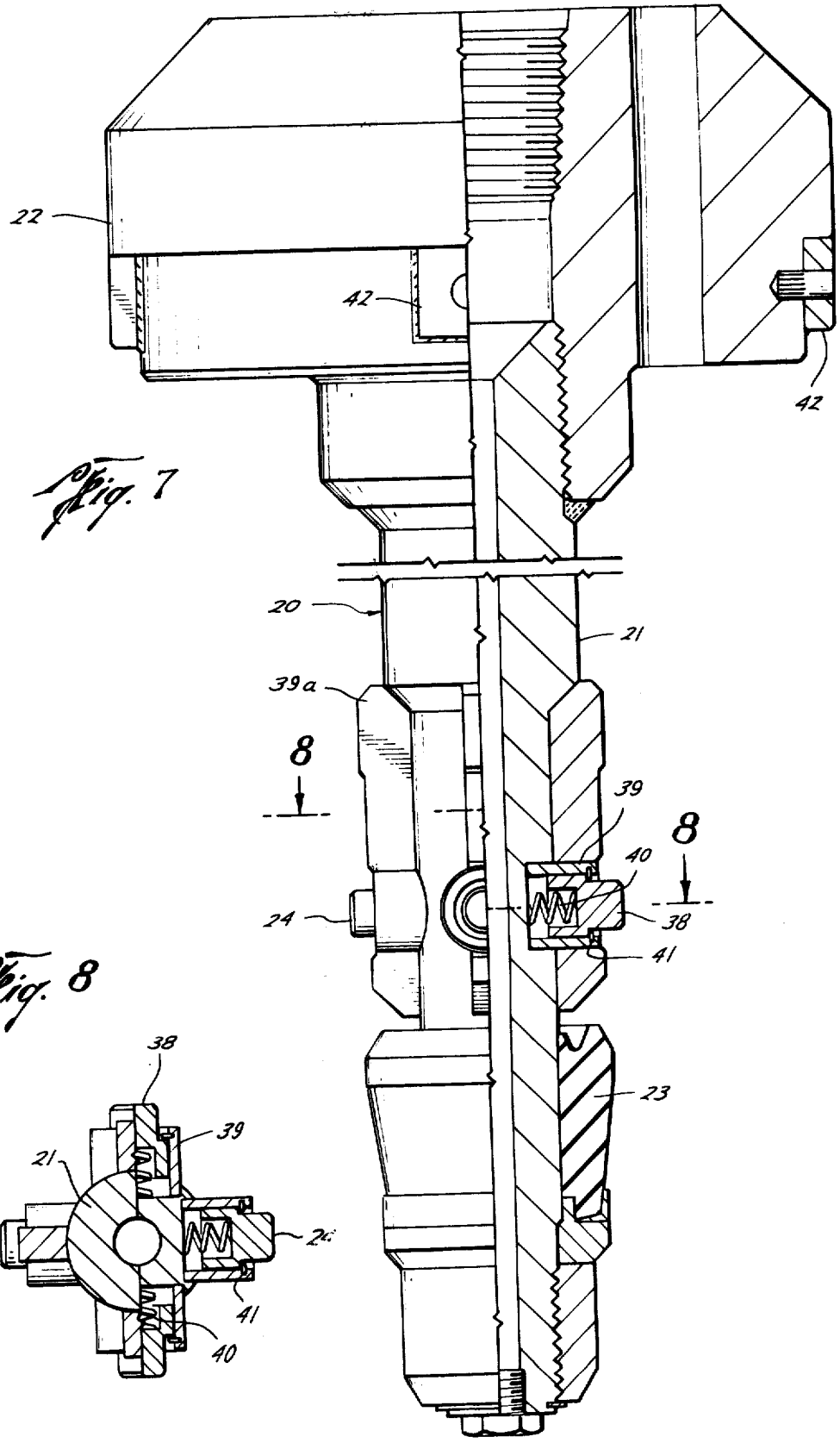

Fig. 7

Fig. 8

WELL APPARATUS

This invention relates to well apparatus of the type in which one member is lowered into a landed position with respect to another member disposed within a wellhead bore. More particularly, it relates to improvements in apparatus of this type in which the one member is so lowered on a running tool which, upon landing of said one member, may be lifted therefrom for removal from the wellhead bore.

Apparatus of this type is shown in U.S. Pat. No. 3,404,736, wherein an annular seal assembly is lowered into a landed position on an underwater casing hanger for sealing between the hanger and the bore of the casing head in which the hanger is suspended so as to close ports which bypass the hanger for circulation of cement returns. As also shown therein, the seal assembly is so lowered by means of a running tool having a body suspended from a pipe string, and pins carried on the body for fitting within "J" slots in the assembly to support it as it is so lowered.

The pins are also useful in transmitting force to the assembly so that the running tool may be manipulated to connect the seal assembly to the casing hanger, as it is so lowered, and then, upon connection and landing of the assembly, manipulated further to activate a seal ring carried thereon for sealing engagement with the wellhead bore. Upon completion of these manipulations, the pins are located in positions within the slots from which they may be lifted to permit removal of the tool from the wellhead bore.

Slots for receiving these pins are difficult and expensive to form. Also, due to its relatively close fit in the wellhead bore above the casing hanger, the seal assembly may be caused to rotate into a position in which pins are free of the slots as the assembly is being lowered toward or raised from landed position. Consequently, the seal assembly may be accidentally released.

It has also been proposed to release pins for running tools of this type by means of hydraulic pressure. However, a mechanism for this purpose is quite expensive, and in any case, susceptible to being rendered inoperative in the event hydraulic pressure is lost for any reason.

Still other running tools of this type are threadedly made up with the member to be lowered, so that in order to be released for removal from the wellhead bore, they must be backed off from the member. This requires the application of substantial torque, thereby necessitating that the joints of pipe of the string on which the tool is run be welded together. Even when this is done, it may be difficult to transmit the required torque through the pipe strings when the member is to be landed a considerable distance below water level.

As also shown in U.S. Pat. No. 3,404,736, the seal assembly includes a first tubular body portion which, during lowering of the seal assembly into landed position, is threadedly connected with the hanger, a seal ring carried about the outer side of such first body portion, and a second tubular body portion connected to the first portion for movement downwardly with respect thereto so as to expand the seal ring against the bore of the casing head. The "J" slots for receiving the pins on the running tool are formed in the second tubular member, so that when the first tubular body portion has been landed and made up with the casing hanger, the running tool may be manipulated further in order to so

lower the second tubular member and thus activate the seal ring.

An object of this invention is to provide well apparatus of this type having a running tool which is relatively inexpensive to manufacture, which is not released upon accidental rotation of the member being run, and which may be released without the necessity of transmitting torque through the pipe string from which it is suspended.

Another object is to provide such apparatus in which the running tool is also useful in connecting the member to be landed to another member within the wellhead bore and in manipulating parts of the landed member, such as is required in activating a seal ring of a seal assembly of the type above described.

These and other objects are accomplished, in accordance with the illustrated embodiments of the present invention, by apparatus in which the means by which the running tool supports the one member is automatically moved out of supporting position during downward movement of the one member into landed position. More particularly, the tool supports the one member by latch means which is engageable with means on the other member disposed within the wellhead bore for moving it from latched to released position, as such one member is so lowered, to permit the tool to be removed from the wellhead bore when the one member is so landed.

Preferably, this means comprises an upwardly facing shoulder on the other member which is so located as to engage a downwardly facing shoulder on the latch means and thereby move it to retracted position prior to landing of the one member. As a result, the latch means moves to a position lower than the shoulder on the other member as the one member is lowered further into landed position, so that the distance between the shoulder on said other member and a downwardly facing shoulder on the one member previously supported by the upwardly facing shoulder on the latch means is less than the distance between the shoulders on the latch means. Consequently, when the tool is raised, the upwardly facing shoulder on the latch means moves upwardly past the downwardly facing shoulder on the one member to permit the tool to be lifted from the one member for removal from the bore.

The latch means comprises at least one latch member carried by the body of the tool for movement between an extended position in which it supports the one member and a retracted position in which it is released from the one member. Each latch member is yieldably urged to its extended position, and thus supports the one member until moved inwardly to retracted position by engagement with the other member. In the preferred embodiment of the running tool, there are a plurality of individually extendible and retractable latch members, each disposed, when extended, beneath the lower end of the one member, so that the accidental retraction of less than all such latch members does not release the one member.

In the illustrated embodiment of the invention, the one member comprises a seal assembly and the other member comprises a casing hanger and as in prior apparatus of this type, the running tool transmits force to the seal assembly to connect it to the hanger, as it is lowered into landed position. More particularly, this force is transmitted by parts on the running tool engageable with parts on the seal assembly, which are in addition to the previously described latch members.

Also, the seal assembly includes a pair of tubular body portions, one of which is adapted to be supported by the running tool for connection to and landing on the casing hanger, and the other of which is adapted to be engaged by the additional parts of the running tool to permit force to be transmitted thereto. The body portions are connected by shear pins to permit this force to be transmitted to the other portion of the seal assembly during its connection and landing. However, when such other portion is landed and connected, the tool may be manipulated further to shear the pins, and thus permit the one portion to move downwardly relative to the other portion and thus move a seal ring disposed between shoulders on said portions into sealing engagement with the bore of the casing head.

In the drawings:

FIG. **1** is a isometric view of a seal assembly supported from a running tool constructed in accordance with the present invention, with each of the seal assembly and running tool broken away in part for purposes of illustration;

FIG. **2** is a partial vertical sectional view of the seal assembly and running tool during lowering of the seal assembly toward landed position on a casing hanger disposed within the casing head bore;

FIG. **3** is a partial sectional view of the lower end of the seal assembly and the casing hanger upon further lowering of the seal assembly and running tool;

FIG. **4** is another partial sectional view similar to FIG. **2**, but upon still further lowering of the seal assembly into connected and landed position on the casing hanger;

FIG. **5** is a partial sectional view of the upper end of the running tool and seal assembly, following connection and landing of the seal assembly, and upon initial rotation of the running tool to move the seal ring toward sealing position;

FIG. **6** is a view similar to FIG. **5**, but upon further rotation of the running tool to so move the seal ring into sealing engagement with the well bore;

FIG. **7** is a discontinuous elevational view, partly in section, of the running tool removed from the seal assembly; and

FIG. **8** is a cross-sectional view of the running tool, as seen along broken line **8—8** of FIG. **7**.

With reference now to the details of the abovedescribed drawings, the running tool, which is indicated in its entirety by reference character **20**, comprises an elongate body **21** having an enlarged head **22** at its upper end and a packer **23** about its lower end. As best shown in FIG. **1**, the seal assembly, which is designated in its entirety by reference character **25**, is disposed about the running tool body beneath the head **22** and supported therefrom by means of latch members **24** extending outwardly beneath its lower end.

As shown in FIG. **2**, running tool body **21** is suspended from a pipe string P, so that, as previously described, it may lower the seal assembly through the bore **26** of a casing head **27** for landing upon and connection to a casing hanger **28** disposed within the bore and suspending a casing string (not shown) therein. As further shown in FIG. **2**, the casing head is connected at its upper end to a connector **28***a* or other wellhead portion, which is in turn connected with a blowout preventer stack (not shown) having a bore which provides an upward continuation of bore **26** through the casing head. Head **22** of the tool body fits closely within the bore, and a series of ports **23***a* extend through the head to facilitate its vertical movement in the bore.

As will be described below, after cement returns have been circulated upwardly through the annular space between the casing hanger and well bore, and the seal assembly has been lowered into the bore to connect to and land on casing hanger **28**, as shown in FIG. **4**, a seal ring **36** carried by the assembly is moved into sealing engagement with the casing head bore, as shown in FIG. **6**, so as to close off such space. As shown in FIG. **2**, casing hanger **28** is landed upon another seal assembly **29**, which in turn is landed upon and connected to another casing hanger **30** from which another casing string (not shown) is suspended within the bore. The outer side of casing hanger **28** is provided with a plurality of recesses **31** thereabout which, when seated on seal assembly **29**, provide ports for connecting the annular space above seal assembly **29** with the annular space between the casing strings suspended from hangers **28** and **30**.

The casing hanger **30** is also landed upon a seal assembly **32** connected to and landed upon still another casing hanger (not shown) for suspending a still further casing string within the bore. This invention contemplates that each such additional seal assembly may be connected, landed and activated in a manner to be described in connection with the seal assembly **25**. It is also contemplated that a lesser or greater number of casing hangers and seal assemblies may be landed within the well bore, and that, in accordance with the broader aspects of the invention, each of the casing hanger and seal assembly may be other members disposable within a well bore.

In any event, and as best shown in FIG. **2**, the seal assembly **25** includes a main body portion **33** having an enlarged upper end having an outer diameter forming a substantial continuation of the upper enlarged end of the running tool body, and a reduced lower end adapted for connection with and landing on casing hanger **28** within an enlarged upper portion **34** of its bore. As shown, the bores through the telescopically arranged lower ends of the seal assembly and the casing hanger are axially aligned of substantially the same diameter. When the seal assembly is landed on the casing hanger, seal rings **35** about the upper end of its reduced lower end fit within and seal against the upper enlarged portion of the bore through the casing hanger.

As shown, seal ring **36** is beneath a tubular body portion **37** of the seal assembly which is threadedly connected at **37***a* to the main portion **33** thereof. Thus, as will be described below, the portion **37** may be rotated by ports on the running tool to move it downwardly relatively to the portion **33** so as to move seal ring **36** into sealing engagement against the casing head bore. For reasons to be described, one or more shear pins **48** connect the portions to cause portion **33** to rotate with portion **37** until sufficient torque is applied to shear the pins.

Each of the latch members **24** comprises a pin disposed within a sleeve **39**, which is carried on a rib **39***a* extending lengthwise of the running tool body, for sliding radially between an extended position, as shown in FIGS. **1**, **2**, and **7**, and a retracted position, as shown in FIG. **4**. When extended, the outer ends **38** of the pins project beyond the adjacent outer ends of ribs **39***a*, which fit closely within the bore of the seal assembly body, and when retracted, the outer ends of the pins are substantially within the outer ends of the ribs so as

to move vertically within the bore of the seal assembly. The pins are normally urged to extended position by means of coil springs **40** disposed within the sleeves, and are located in extended positions by means of snap rings **41.**

The seal assembly is assembled on the running tool by movement of its main body portion **33** upwardly over the lower end of the running tool until the shoulder formed by the lower end of the main body portion is disposed above the upper shoulders of the latch members **24,** so as to permit the latch members to be urged outwardly to extended positions for supporting the seal assembly for lowering therewith. Of course, during movement of seal assembly body portion **33** upwardly over the lower end of the tool body, its bore above its lower end will force latch members inwardly to retracted positions. With the seal assembly so supported on the latch members, a shoulder **33***a* on the lower side of the enlarged upper end of the running tool body will be spaced a short distance above the upper end of the body portion **33,** and a shoulder **33***b* about the outer side of the upper end of the tool is spaced a somewhat greater distance above the upper end of seal assembly body portion **37.** Although the lower ends of lugs **42** about the outer side of the enlarged head of the tool are also spaced the somewhat greater distance above the lower ends of similarly shaped recesses **43** about the upper end of body portion **37** of the seal assembly, they are nevertheless disposed between the sides of the recesses to enable force to be transmitted from the running tool to the seal assembly for the purposes and in a manner to be described.

The lower end of the main body portion of the seal assembly has external threads **44** adapted to be connected with internal threads **45** on the enlarged bore in the upper end of the casing hanger. During make up of threads **44** with threads **45,** a shoulder **46** on the bottom side of the upper enlarged end of the seal assembly is adapted to land on an upwardly facing shoulder **47** formed on the upper end of the casing hanger. Upon rotation of the running tool, lugs **42** thereon engage with the sides of recesses **43** in body portion **37** of the seal assembly, and shear pins **48** rotate body portion **33** with body portion **37** so as to make up threads **44** with threads **45.** Then, when shoulders **46** and **47** are engaged, continued rotation of the running tool shears pins **48** and thus moves body portion **37** downwardly relative to portion **33** for moving seal ring **36** into sealing position.

When the lower ends of threads **44** have been lowered onto the upper end of threads **45,** the seal assembly will be prevented from further downward movement. Thus, continued lowering of the running tool will cause its lower end, and thus the upper shoulders on the latch members, to move downwardly relative to the seal assembly a distance equal to the spacing of the upper end of the seal assembly beneath the enlarged head of the running tool body. At this time, the running tool is rotated so as to begin making up threads **44** with threads **45** in order to connect the seal assembly to the casing hanger.

As the threads are made up, the downwardly facing shoulders on the lower ends of the latch members engage an upwardly facing shoulder **49** on the bore of the casing hanger. As shown, this shoulder tapers downwardly and inwardly, and the outer end of each latch member pin is beveled, so that further making up of the threads **44** and **45** causes the shoulders formed on the lower ends of the latch members to slide downwardly over the tapered shoulder **49,** and thus be urged inwardly toward retracted position. At some point intermediate the positions shown in FIGS. **3** and **4,** seal rings **35** will move into sealing engagement with the enlarged bore in the upper end of the casing hanger, and the latch members will move to fully retracted positions, so that still further making up of threads **44** and **45** will cause the flat outer ends **38** of the latch members to slide downwardly within the reduced bore of the casing hanger beneath shoulder **49** until shoulder **46** lands on shoulder **47,** as shown in FIG. **4.**

At this time, the downwardly facing shoulder on the lower end of the seal assembly will be spaced above the shoulder **49** on the casing hanger a vertical distance less than that between the shoulders formed on the top and bottom surfaces of the latch members. Consequently, upon lifting of the running tool body, the latch members are unable to move back into the space between the shoulders on the seal assembly and casing hanger, and are thus held in retracted positions as they move upwardly within the bore through the body of the seal assembly, thereby permitting the tool to be lifted from the seal assembly and thus removed from the bore.

However, before it is lifted from the seal assembly, the running tool is further manipulated in order to move seal ring **36** into sealing engagement with the well bore. For this purpose, the running tool continues to be rotated and, since shoulder **46** is landed on shoulder **47,** this shears the pins **48,** as shown in FIG. **5,** and thus causes the threads on body portion **37** to move downwardly over the threads on body portion **33.** When this occurs, the lower end of portion **37** forces seal ring **36** downwardly from a position surrounding a reduced cylindrical surface **50** about the outer side of body portion **33** to a position surrounding an enlarged cylindrical surface **51** thereabout.

As shown, when the sealing ring is disposed about the smaller cylindrical surface, it is in a relatively relaxed condition with its outer diameter substantially aligned with the outer diameter of seal assembly body portion **37,** and thus spaced from bore **26** of the wellhead. However, when the seal ring has been moved over the large cylindrical surface **51,** it is stretched to cause its inner diameter to tightly seal against surface **51** and its outer diameter to tightly seal against the bore **26,** thereby sealing between the seal assembly and bore, and thus, in cooperation with seal rings **35,** closing off the annular space between the casing hanger and the bore.

A sleeve **52** is connected about body portion **33** of the seal assembly by means of one or more shear pins **53** with its upper end disposed a short distance below the lower end of the seal ring when disposed about surface **50,** and thus in position to protect the seal ring from obstructions in the well bore as the seal assembly is lowered therein. Downward movement of the seal ring onto the surface **51** will shear pins **53** to permit sleeve **52** to drop to its lower position shown in FIG. **6,** in which its upper end provides the lower limit of downward movement of the seal ring.

As shown in FIG. **6,** downward movement of body portion **37** is limited by engagement of its lower end with a conical surface between cylindrical surfaces **50** and **51.** Thus, when seal ring **36** is lowered into its sealing position, it occupies a vertical space between the upper end of ring **52** and the lower end of body portion

37 which is greater than its height. As a result, the seal ring is free to shift within the space and thus respond to predominant pressures, from either above or below, to maintain a pressure energized seal between the seal assembly and well bore.

As will be appreciated, during this further rotation of the running tool, it is held against downward movement by seating of the lower side of its enlarged upper end on the upper end of the seal assembly body portion **33**. Although the body portion **37** has moved a fairly substantial distance downwardly, as indicated by a comparison of FIGS. **2** and **6**, it nevertheless maintains rotative engagement with the running tool body through lugs **42** fitting within recesses **43**.

The sealing engagement of the seal ring **36** with well bore **26** and seal assembly body portion **33** may be tested by means of test pressure admitted to the annular space between the pipe string P and the bore **26** of the wellhead intermediate the seal assembly and rams on the blowout preventer stack which are closed on the pipe string. In this connection, it will be noted that packer **23** carried about the lower end of the running tool body **21** sealably engages the reduced bore through casing hanger **28**, and that seal rings **35** on seal assembly body portion **33** sealably engage casing hanger **28**.

If seal ring **36** holds test pressure, the running tool need only be lifted from the well bore as previously described. However, in the event seal ring **36** does not hold test pressure, the running tool may be rotated in the opposite direction to raise body portion **37** to its original position, at wich time further raising thereof is prevented by a latch **54**. As a result, continued rotation of the running tool will back threads **44** out of threads **45** to release the seal assembly from the casing hanger. As this occurs, latch members **24** will move back into extended positions beneath the lower end of the seal assembly for lifting the assembly from the well bore with the running tool. The stretched seal ring **36** may be caused to move back onto reduced surface **50**, and thus out of the way of obstructions within the well bore, by reciprocating the running tool as it first begins to lift the seal assembly.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

The invention having been described, what is claimed is:

1. Apparatus for use in a wellhead, comprising a first member disposable within the bore of the wellhead and having an upwardly facing shoulder, a second member having a downwardly facing shoulder and adapted to be lowered into a landed position within the bore in which it is arranged telescopically with respect to the first member and above the shoulder of the first member, and a tool for so lowering the second member, including a body adapted to be arranged telescopically with respect to said second member, latch means comprising at least one latch member carried by the body for movement between extended and retracted positions, and means yieldably urging each latch member to extended position, each said latch member having an upwardly facing shoulder which is disposed beneath the downwardly facing shoulder on said second member, when said latch member is in extended position, so as to support said second member for lowering with said tool, and a downwardly facing shoulder which is engageable with said upwardly facing shoulder of the first member, during lowering of said second member with said tool, so as to move said latch member to retracted position in which it is withdrawn from beneath said shoulder on said second member, said second member continuing to move downwardly to landed position, following movement of each latch member to retracted position, until the vertical distance between the shoulders on said members is less than that between the shoulders on said latch member, whereby each latch member will be held in retracted position by said second member as it is lifted with said tool body above the downwardly facing shoulder on said second member.

2. Apparatus of the character defined in claim **1**, wherein the downwardly facing shoulder is on the lower end of said second member.

3. Apparatus of the character defined in claim **1**, wherein the second member fits telescopically within the first member when landed, and the running tool body fits telescopically within the first member.

4. Apparatus of the character defined in claim **1**, including means on the second member for connecting it to the first member, as it is lowered into landed position.

5. Apparatus of the character defined in claim **2**, including means on the first member for supporting the second member in landed position.

6. Apparatus of the character defined in claim **4**, including means on the tool body engageable with the second member for transmitting a downward force thereto in order to connect it to said first member.

7. Apparatus of the character defined in claim **5**, including means on the tool body engageable with the second member for transmitting a downward force in order to connect it to said first member.

8. Apparatus for use in a wellhead, comprising a first member disposable within the bore of the wellhead, a second member adapted to be lowered into a position in which it is landed on and arranged telescopically with respect to the first tubular member, said second member having a downwardly facing shoulder, and said first member having an upwardly facing shoulder which is beneath the lower end of said second member when said second member is landed thereon, and a tool for so lowering the second member, including a body, at least one latch member carried by the body for movement between extended and retracted positions, and means for yieldably urging each latch member to extended position, each latch member having an upwardly facing shoulder disposable beneath the downwardly facing shoulder on said second member, when in extended position, so as to support said second member for lowering therewith into landed position, and a downwardly facing shoulder for engaging the upwardly facing shoulder on the first member, during lowering of said second member into landed position, so as to move said latch member to retracted position in which the upwardly

facing shoulder thereon is withdrawn from beneath the downwardly facing shoulder on said second member, said second member continuing to move downwardly to landed position, following moving of each latch member to retracted position, until the vertical distance between the shoulders on said members is less than that between the shoulders on said latch member, whereby each latch member will be held in retracted position by said second member as it is lifted with tool body above the downwardly facing shoulder on said second member.

9. Apparatus of the character defined in claim **8,** including means on the second member for connecting it to the first member, during lowering into landed position, and means on the tool body engageable with the second member for transmitting a downward force in order to connect it to said first member.

10. Apparatus for use in a wellhead, comprising a member adapted to be lowered into a landed position within the bore of the wellhead, and a tool including a body adapted to be arranged telescopically with respect to the member, at least one latch member carried by the body for movement between extended and retracted positions, and means yieldably urging each latch member to extended position, said member having a downwardly facing shoulder on its lower end, and each said latch member having an upwardly facing shoulder thereon disposable beneath the shoulder on the member, when said tool body is so arranged and said latch member is so extended, so as to support said member for lowering therewith, and a downwardly facing shoulder thereon beneath said upwardly facing shoulder.

11. Apparatus of the character defined in claim **10,** wherein there are a plurality of individually extendible and retractable latch members.

12. Apparatus of the character defined in claim **10,** wherein said member includes first and second telescopically arranged tubular body portions which are movable vertically with respect to one another, and a seal ring disposed between oppositely facing shoulders on the first and second body portions in position to be expanded in response to such movement, said first body portion having the upwardly facing shoulder thereon, and said tool body having means thereon engageable with said second body portion for transmitting a downward force thereto.

13. Apparatus of the character defined in claim **12,** including shear means releasably connecting said first and second body portions to one another.

14. Apparatus for use in a wellhead, comprising a first member disposable within the bore of the wellhead, a second member adapted to be lowered into a position in which it is landed on and arranged telescopically with respect to the first tubular member, said second member having a downwardly facing shoulder, and said first member having an upwardly facing shoulder which is beneath the lower end of said second member when said second member is landed thereon, and a tool for so lowering the second member, including a body, at least one latch member carried by the body for movement between extended and retracted positions, means for yieldably urging each latch member to extended position, each latch member having an upwardly facing shoulder disposable beneath the downwardly facing shoulder on said second member, when in extended position, so as to support said second member for lowering therewith into landed position, and a downwardly facing shoulder for engaging the upwardly facing shoulder on the first member, during lowering of said second member into landed position, so as to move said latch member to retracted position in which the upwardly facing shoulder thereon is withdrawn from beneath the downwardly facing shoulder on said second member, said second member continuing to move downwardly to landed position, following moving of each latch member to retracted position, until the vertical distance between the shoulders on said members is less than that between the shoulders on said latch member, whereby each latch member will be held in retracted position by said second member as it is lifted with said tool body above the downwardly facing shoulder on said second member, means on the second member for connecting it to the first member, during lowering into landed position, said connecting means being disconnectible, upon raising of said second member from landed position, so that each latch member is yieldably urged to extended position to permit said second member to be raised with said tool, and means on the tool for transmitting force to said second member for selectively connecting and disconnecting it with respect to said first member.

15. Apparatus of the character defined in claim **14,** wherein the downwardly facing shoulder is on the lower end of said second member.

16. Apparatus for use in a wellhead, comprising a first member disposable within the bore of the wellhead and having an upwardly facing shoulder, a second member having a downwardly facing shoulder and adapted to be lowered into a landed position within the bore in which it is arranged telescopically with respect to the first member and above the shoulder of the first member, and a tool for so lowering the second member, including a body adapted to be arranged telescopically with respect to said second member, latch means comprising at least one latch member carried by the body for movement between extended and retracted positions, and means yieldably urging each latch member to extended position, each said latch member having an upwardly facing shoulder which is disposed beneath the downwardly facing shoulder on said second member, when said latch member is in extended position, so as to support said second member for lowering with said tool, and a downwardly facing shoulder which is engageable with said upwardly facing shoulder of the first member, during lowering of said second member with said tool, so as to move said latch member to retracted position in which it is withdrawn from beneath said shoulder on said second member, said second member continuing to move downwardly to landed position, following movement of each latch member to retracted position, until the vertical distance between the shoulders on said members is less than that between the shoulders on said latch member, whereby each latch member will be held in retracted position by said second member as it is lifted with said tool body above the downwardly facing shoulder on said second member, means on the second member for connecting it to the first member, during lowering into landed position, said connecting means being disconnectible, upon raising of said second member from landed position, so that each latch member is yieldably urged to extended position to permit said second member to be raised with said tool, and means on the tool for transmitting force to said second member for selectively connecting and disconnecting it with respect to said first member.

17. Apparatus of the character defined in claim 16, wherein the downwardly facing shoulder is on the lower end of said second member.

18. Apparatus for use in a wellhead, comprising a first member disposable within the bore of the wellhead and having an upwardly facing shoulder, a second member having a downwardly facing shoulder and adapted to be lowered into a landed position within the bore in which it is arranged telescopically within the first member and above the shoulder of the first member, and a tool for so lowering the second member, including a body adapted to be arranged telescopically within said second member, latch means comprising at least one latch member carried by the body for movement between extended and retracted positions, means yieldably urging each latch member to extended position, each said latch member having an upwardly facing shoulder which is disposed beneath the downwardly facing shoulder on said second member, when said latch member is in extended position, so as to support said second member for lowering with said tool, and a downwardly facing shoulder which is engageable with said upwardly facing shoulder of the first member, during lowering of said second member with said tool, so as to move said latch member to retracted position in which it is withdrawn from beneath said shoulder on said second member, and means for holding the latch member in said retracted position as said latch means is raised, upon lifting of said tool, above the downwardly facing shoulder on said second member.

19. Apparatus of the character defined in claim 18, wherein the downwardly facing shoulder is on the lower end of said second member.

20. Apparatus for use in a wellhead, comprising a first member disposable within the bore of the wellhead and having an upwardly facing shoulder, a second member having a downwardly facing shoulder and adapted to be lowered into a landed position within the bore in which it is arranged telescopically with respect to the first member and above the shoulder of the first member, and a tool for so lowering the second member, including a body adapted to be arranged telescopically with respect to said second member, latch means comprising at least one latch member carried by the body for movement between extended and retracted positions, and means yieldably urging each latch member to extended position, each said latch member having an upwardly facing shoulder which is disposed beneath the downwardly facing shoulder on said second member, when said latch member is in extended position, so as to support said second member for lowering with said tool, and a downwardly facing shoulder which is engageable with said upwardly facing shoulder of the first member, during lowering of said second member with said tool, so as to move said latch member to retracted position in which it is withdrawn from beneath said shoulder on said second member, means for holding the latch member in said retracted position as said latch means is raised, upon lifting of said tool, above the downwardly facing shoulder on said second member, said second member including first and second telescopically arranged tubular body portions which are connected for vertical movement with respect to one another, and a seal ring disposed between oppositely facing shoulders on the first and second body portions in position to be expanded in response to such movement, said first body portion having the upwardly facing shoulder thereon, means for connecting the first body portion to the first member during lowering of the second member into landed position, said tool body having means thereon engageable with said second body portion for transmitting a force thereto for connecting the first body portion to the first member and then moving said second body portion downwardly with respect to said first body portion.

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