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TWO-PART MINE PROP

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Fig. 5

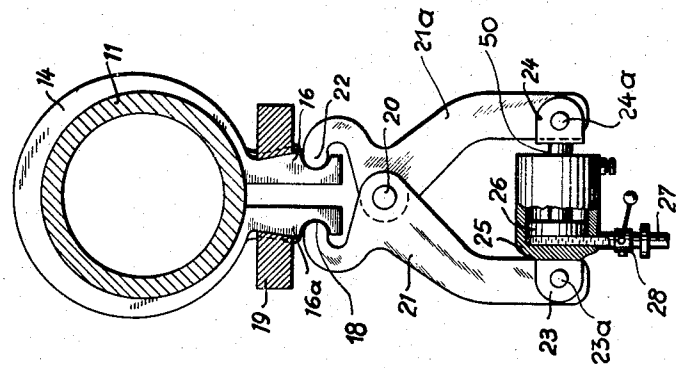


Fig. 2

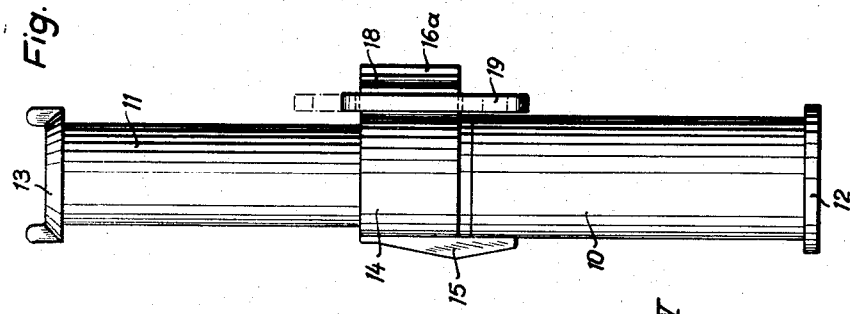


Fig. 4

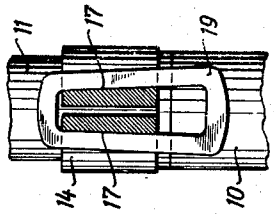


Fig. 3

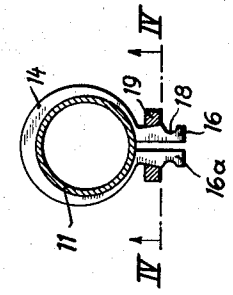


Fig. 1

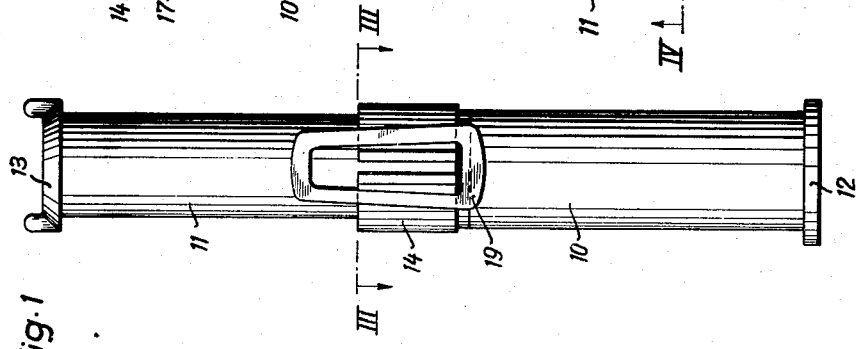

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Fig. 6

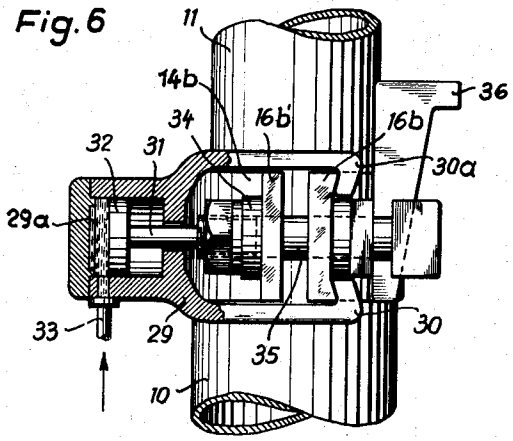


Fig. 6a

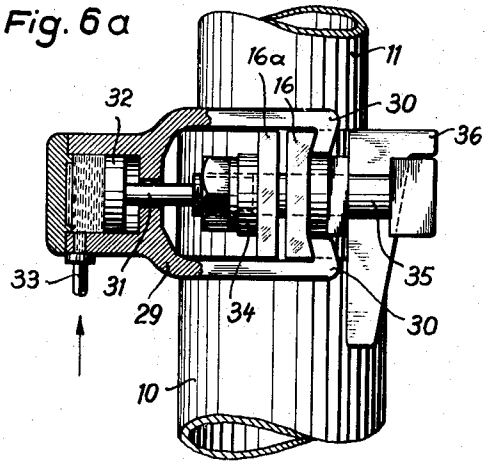


Fig. 7

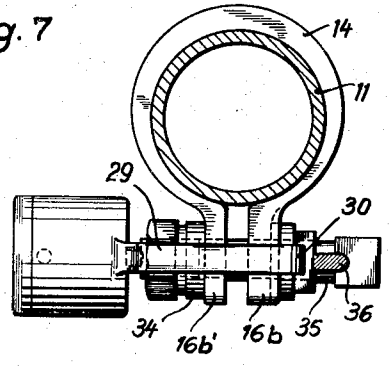

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Fig. 8

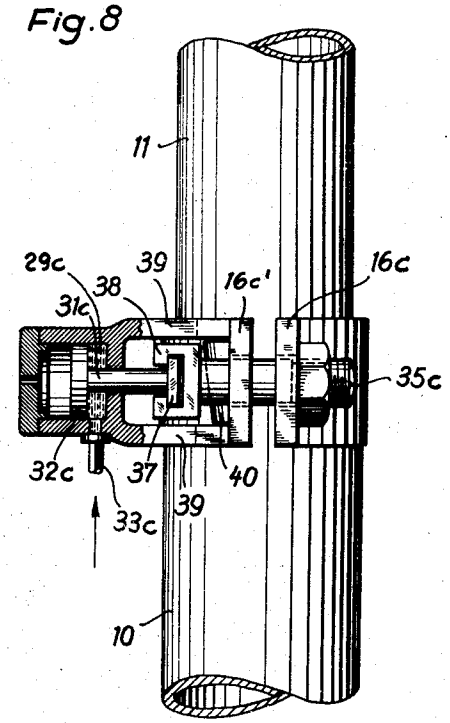


Fig. 9

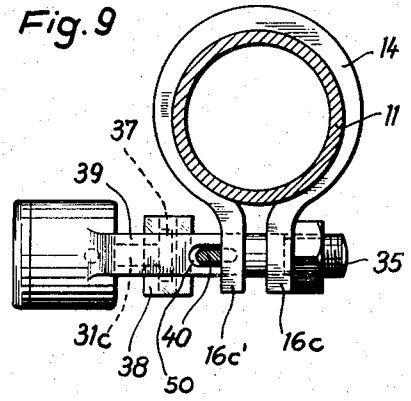

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Fig. 10

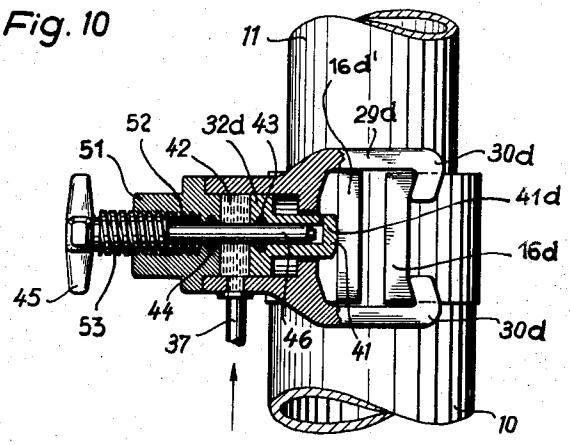



Fig. 10a

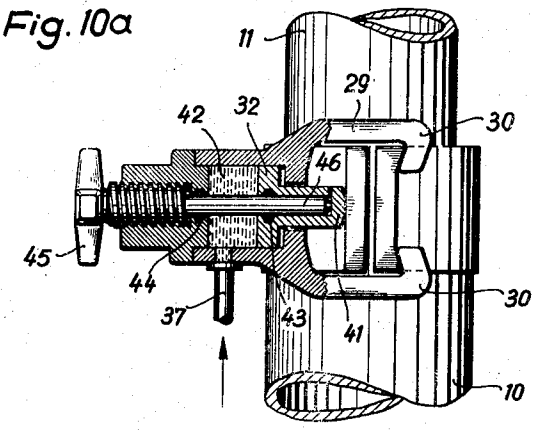
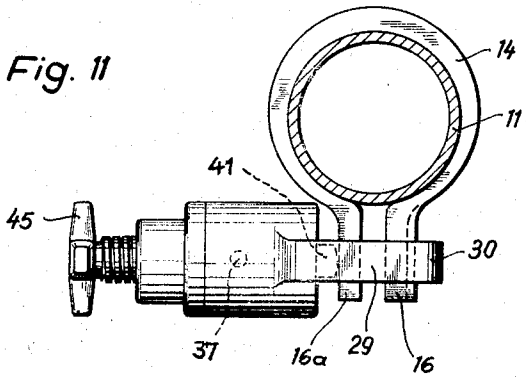



Fig. 11



United States Patent Office 2,953,343 Patented Sept. 20, 1960



2,953,343

# TWO-PART MINE PROP

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Filed Oct. 24, 1957, Ser. No. 692,152

10 Claims. (Cl. 248—354)

The present invention relates to a two-part metallic mine prop. With mine props of this type it is common knowledge to fix the two prop members, an upper prop member and a lower prop member, relative to each other in operating position by means of a prop lock, while for purposes of robbing or abstracting the prop, the two prop members are released so that they can telescope relative to each other.

With most two-part metallic mine props, the prop members are held relative to each other in their supporting position by a frictional force preventing the sinking of the upper prop member. This frictional force depends on the frictional surfaces of said two prop members, which are in frictional engagement with each other and also on the pressure at which said frictional surfaces are pressed against each other, said pressure generally being produced by the elastic deformation of one or a plurality of locking elements. Thus, the magnitude of the frictional force is among others dependent on the obtainment of a certain degree of deformation of the locking elements during the tightening of the lock.

In order that the supporting ability will be at least approximately uniform for all mine props installed at the same working station, it is necessary to apply uniform force to each mine prop in order to obtain uniform elastic deformation of the lock element. If the elastic deformation of the locking elements is obtained by wedge means, it is necessary to drive the locking wedges at such a force that the same end condition will be obtained with each mine prop at the same working station. It is obvious that such a condition cannot be realized in view of the fact that it is impossible for human beings to develop such fine discriminative feel, particularly since also differences in the material of the respective locking elements are unavoidable.

It is, therefore, an object of the present invention to provide a two-part mine prop, in which the elastic deformation of the locking elements will be approximately the same with all mine props installed at the same working station.

It is another object of this invention to provide a mine prop of the type set forth in the preceding paragraph, in which the prop members of each mine prop will be held in their finally set position by a mechanical latching mechanism.

It is another object of this invention to provide a two-part mine prop, in which the prop members can be clamped against each other at a certain precisely defined predetermined pressure by means of a clamping ring connecting the upper prop member with the lower prop member for bringing about frictional engagement between the upper and lower prop members.

It is still another object of this invention so to design a clamping ring for clamping the upper and lower prop members of a mine prop together that the frictional pressure at which the inner surface of the clamping ring acts upon the upper prop member will have at least



nearly uniform pressure along the entire circumference of said clamping ring.

It is a further object of this invention so to design the frictional pressure producing means for a two-part mine prop that said frictional producing means may selectively be detached from the mine prop to reduce the weight of the mine prop.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

Fig. 1 diagrammatically illustrates the front view of a mine prop with a clamping ring according to the invention.

Fig. 2 is a side view of the mine prop shown in Fig. 1.

Fig. 3 is a section taken along the line III—III of Fig. 1.

Fig. 4 is a vertical section taken along the line IV—IV of Fig. 3.

Fig. 5 is a horizontal section through a mine prop similar to that of Fig. 3 but on a larger scale than the latter and equipped with a clamping pressure producing device.

Fig. 6 is a side view of a modified clamping lock, showing the locking mechanism in open position.

Fig. 6*a* is a view similar to that of Fig. 6 but with the locking mechanism in locked or latched condition.

Fig. 7 is a top view of Fig. 6.

Fig. 8 represents the side view of a further modification of a mine prop locking arrangement according to the invention.

Fig. 9 is a top view of the lock shown in Fig. 8.

Fig. 10 represents a side view of a further modified mine lock in opened condition.

Fig. 10*a* shows the mine lock of Fig. 10 in closed position.

Fig. 11 is a top view of the arrangement shown in Fig. 10.

*General arrangement*

The mine prop according to the invention is characterized primary in that the parts of the mine prop in working condition of the latter are while elastically deforming the same tightened relative to each other and are mechanically latched, while the tightening of the lock is effected by a fluid pressure operable device. The actuating fluid may be in gaseous or liquid condition. As actuating fluid or pressure medium among others compressed air may be used which is amply available in mining installations. If desired, however, the pressure fluid means may be compressed by means of a corresponding pump. Also water or oil may be employed as pressure fluid. In some instances the pressure in the strut water line will suffice in order to produce the power in the fluid pressure operable device for producing the tightening action.

When the fluid pressure operable tightening device has brought about the desired elastic deformation and thereby the required tightening of the lock, the latching of the lock is effected mechanically. Locking means to this end may comprise a wedge, a clamping screw, or other adjustable locking means. After such locking means have become effective, the pressure fluid in the fluid pressure operable device may be released therefrom.

In order to be able at high precision to maintain the locking tension produced by the fluid pressure operable device and to do so by a mechanical latching mechanism, the arrangement is in conformity with a further development of the invention so selected that with a two-part mine prop according to the invention, the fluid pressure operable clamping device will attack at the lock in the same plane as the device employed for latching the lock

under tension. In this way it will be possible precisely to maintain the clamping effect in the lock obtained by the hydraulic clamping device, at precisely the adjusted value without running the risk that when lowering the hydraulic pressure or when removing the clamping device, a change in the clamping condition will occur.

A very important field of employment of the present invention is the employment of such two-part mine props in which the upper prop member and also the lower prop member are in frictional engagement with each other through the intervention of a clamping ring connected to the lower prop member. Preferably, the upper prop member as well as the lower prop member are designed as hollow cylinders or hollow cylindrical tubes. The tightening of the clamping ring is with a mine prop of the above mentioned type effected by pulling toward each other the two ears connected to or forming a part of the free ends of the clamping ring. The forces exerted upon the ears when tightening the clamping ring first act in circumferential direction. By means of the ring, the said forces are split up in radially directed force components which produce the important frictional pressure for tightening the mine prop members relative to each other. This frictional pressure should be substantially uniform along the circumference of the clamping ring. In order to obtain this goal, in conformity with the present invention, the clamping ring is so designed that its cross section beginning from the ends increases gradually toward the center in the manner of a girder of uniform resistance. In this way, the forces acting upon the ends of the clamping ring are sub-divided and distributed over the entire prop circumference to produce a uniform frictional pressure. While the fluid pressure operable clamping device contracts the clamping ring at the ends thereof to an ever increasing extent, the deforming forces exerted in this way upon the clamping ring are distributed in such a way that at the end condition of the tightening operation, a uniform frictional pressure is exerted upon the upper mine prop member. This tensioning condition is then maintained by making the mechanical latching means effective for the entire period in which the mine prop occupies its working position.

*Structural arrangement*

Referring now to the drawings in detail and Figs. 1 to 5 thereof in particular, the mine prop shown therein comprises a tubular lower prop member **10** telescopically engaged by an upper tubular prop member **11**. The prop member **10** is provided with a foot **12** while the upper prop member **11** is provided with a head **13**. The device furthermore comprises a clamping ring **14** the free ends of which have connected thereto ears **16** and **16***a*. The lower prop member **10** and the clamping ring **14** are connected to each other by a band **15** connected to said clamping ring and said lower prop member **10** in any convenient manner for instance by welding.

As will be evident from Figs. 3 and 5, the thickness of the clamping ring increases in a continuous manner from the ears **16** and **16***a* toward that portion which is diametrically opposite the gap between said ears. The height of the clamping ring is the same along the entire circumference thereof as is particularly clearly shown in Figs. 1 and 2. The increase in the cross section from the ears **16**, **16***a* toward that portion of the clamping ring which is diametrically opposite the gap between the ears **16**, **16***a* is such that the strength of the clamping ring is substantially uniform throughout the same in the manner of a girder of even strength. Such an arrangement brings about the advantage that the force exerted upon the ends of the clamping ring is split up into such radial force components that the frictional pressure exerted by the clamping ring **14** upon the tubular upper prop member **11** will have approximately the same value throughout the circumference of the clamping ring when the latter is in clamped condition.



With the arrangement according to Figs. 1 to 5, the ears **16** and **16***a* increase in thickness from their connecting point with the clamping ring **14** towards the outside, their lateral surfaces **17** being inclined as shown in Fig. 4. The said ears are provided with grooves **18** adapted to be engaged by the jaws **22** of the plier-like arranged arms **21** and **21***a* which are pivotally connected to each other by a pivot **20**. The outer ends of the arms **21** and **21***a* are pivotally connected by pivots **23***a* and **24***a* to ears **23** and **24** respectively. The ear **23** is connected to a pressure cylinder **25**, whereas the ear **24** is connected to a piston rod **50** which in its turn is connected to the piston **26** reciprocably mounted in the pressure cylinder **25**. The cylinder **25** communicates with a pipe **27**. A relief valve **28** is interposed between the pipe **27** and the cylinder **25**.

When the mine prop has been adjusted as to height and when the clamping ring is to be tightened, the jaws **22** of the arms **21**, **21***a* are caused to engage the recesses **18**, and pressure fluid is conveyed to the cylinder **25** through pipe **27** and valve **28**. As a result thereof, the clamping ring is contracted. The piston **26** moves relative to the cylinder **25** until a certain maximum pressure has been established within the cylinder piston system **25**, **26** which maximum pressure is determined by the setting of the relief valve **28**. The trapezoidal wedge-shaped body **19** drops during the tightening operation effected by the clamping ring from the position shown in Fig. 1, which position corresponds to the open position of the clamping ring, into the position shown in Fig. 4 along the inclined surfaces **17** of the clamping ring. Thus, the lock when in tightened condition is latched by the member **19**. When relieving the fluid from the cylinder piston system **25**, **26**, the plier-like device **21**, **21***a* can be opened and can be withdrawn from the ears **16**, **16***a* of the clamping ring, while the mine prop remains in operative position in view of the locking by the member **19**.

When robbing or abstracting the mine prop, it is merely necessary to knock the wedge body **19** upwardly whereby the clamping ring **14** will be released and the upper prop member **11** will due to its own weight sink downwardly.

According to the embodiment shown in Figs. 6, 6*a* and 7, the tightening device is provided with a fork-shaped portion **29** the ends of which are provided with jaws **30**, **30***a* respectively. These jaws catch from above and below behind the ears **16***b* of the clamping ring **14***b*, whereas the piston rod **31** connected to the piston **32** due to fluid pressure admitted through pipe **33** acts through a collar **34** connected to piston rod **31** upon the ear **16***b'*. In this way, the ears **16***b* and **16***b'* are moved toward each other thereby bringing about a tightening of the clamping ring **14***b*. The wedge **36** will then move downwardly in a slot provided in bolt **35** which is connected to the ear **16***b'*. In this way the lock is latched or locked in its respective tightened position. After the wedge **36** has latched the lock, the pressure fluid may be relieved from the cylinder **29***a* so that the piston rod **31** may be pushed back and the entire tightening device including the cylinder **29***a* with fork **29** and jaws **30**, **30***a* may be removed from the mine prop while the latter remains in its operative position due to the wedge **36**. The tightening device may then be used for tightening the lock of another mine prop.

As has been particularly clearly shown in Fig. 7, those points where the jaws of the tightening element or the latching bolts are effective upon the ears **16***b* and **16***b'* are located in the same plane.

According to the arrangement shown in Figs. 8 and 9, the piston rod **31***c* of the piston **32***c* is provided with a head **37** which is located within the jaw **38** which latter

is connected to one end of the bolt **35***c*. If pressure fluid is conveyed into the cylinder **29***c* through the conduit **33***c*, the piston rod **31***c* will pull the bolt **35***c* toward the left with regard to Fig. 8 thereby also moving the ear **16***c* which is connected to bolt **35***c* toward the left. Similarly the pressure acting in the cylinder **29***c* moves the fork-shaped portion **39** toward the right thereby causing the ear **16***c'* engaged by the fork-shaped portion **39** to move toward the right so that the ears **16***c* and **16***c'* are moved toward each other thereby 'ghtening the clamping ring. This arangement is furthermore provided with a wedge **40** which in its effect corresponds to the wedge **36** of Fig. 6*a* and extends through a corresponding slot **50**. This wedge **40** brings about the locking or latching of the clamping device.

The tightening device according to Figs. 10, 10*a* and 11 is likewise so designed that one of the two ears namely the ear **16***d* is grasped by the jaws **30***d* of the fork-shaped portion **29***d*, whereas the piston **32***d* has connected thereto a hollow piston rod **41** which is adapted to engage the ear **16***d'*. Extending into the hollow piston **41** is a bolt **46** which extends into the cylinder head **51** which latter is provided with a threaded bore **52**. The threaded bore **52** is engaged by a correspondingly threaded bolt **53** provided with a handle **45**.

If pressure fluid is admitted through conduit **37** into the cylinder **42**, the ears **16***d* and **16***d'* are moved toward each other. When the lock is properly tightened, the threaded bolt **53** by means of the handle **45** is rotated so as to cause the bolt **46** to engage the end wall **41***d* of the hollow piston rod **41**. In this way, the tightening device is mechanically locked so that the pressure fluid may be released from the cylinder **42**.

The arrangement according to Figs. 10, 10*a* and 11 is furthermore provided with sealing means **43** and **44** to prevent pressure fluid from entering the interior of the tightening elements, especially the thread **52** in the cylinder head **51**.

It is, of course, to be understod that the present invention is, by no means, limited to the particular constructions shown in the drawings but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. A two-part mine prop comprising inner and outer telescoping members, a clamping element carried by the telescoping end of the outer member operable to clamp the inner member to secure said members against telescoping movement, a force applying device adjustable to exert a desired force engageable with said clamping element to actuate said element to clamp said inner member, and a locking member movable to engage said clamping element to lock said clamping element upon actuation to clamp said inner member.

2. In combination in a lock arrangement for a mine prop having a first prop member and a second prop member telescopically movable in said first prop member: clamping ring means carried by said first prop member and adapted to be tightened to thereby clamp said prop members together in their respective relative position, pressure fluid operable means detachably supported by one of said prop members and detachably engaging said clamping ring means, said pressure fluid operable means being operable to tighten said clamping ring means, and mechanical locking means engaging said clamping ring means and operable mechanically to lock said clamping ring means in the tightened position into which it was moved by said pressure fluid operable means and to hold said clamping ring means in said tightened position regardless of the status of operation of said pressure fluid operable means.

3. An arrangement according to claim 1, in which said pressure fluid operable means and said mechanical locking means are arranged to act upon said clamping ring means in substantially one and the same plane.

4. In combination in a lock arrangement for a mine prop having a first prop member and a second prop member telescopically movable in said first prop member: clamping ring means carried by said first prop member and adapted to be tightened to thereby clamp said prop members together in their respective relative poistion, pressure fluid operable means supported by one of said prop members and operable to engage said clamping ring means for tightening the same, pressure relief valve means associated with said pressure fluid operable means for limiting the tightening force exerted by said pressure fluid operable means upon said clamping ring means to a predetermined value, and mechanical locking means for engaging said clamping ring means and for mechanically locking said clamping ring means in tightened position of the latter.

5. In combination in a lock arrangement for a mine prop having a lower prop member and an upper prop member telescopically movable in said lower prop member: an open clamping ring member having its free ends provided with ears spaced from each other and being connected to said lower prop member, the cross section of said clamping ring member increasing from said ears toward a line substantially opposite the gap between said ears, a fluid pressure cylinder piston assembly supported by said lower prop member and operable to engage said ears and to move the same toward each other to thereby tighten said clamping ring member and effecting frictional connection between said prop members, and mechanical locking means biased to engage said clamping ring member and mechanically to lock the same in its respective tightened position.

6. In combination in a lock arrangement for a mine prop having a first prop member and a second prop member telescopically movable in said first prop member: an open clamping ring having its free ends provided with ears extending outwardly, said clamping ring being carried by said first prop member and being adapted to be tightened to thereby clamp said prop members together and to hold the same in frictional engagement with each other, pressure fluid operable means supported by one of said prop members, power conveying means operatively connected to said pressure fluid operable means and arranged to convey clamping pressure from said pressure fluid operable means to said clamping ring through said ears, and a frame-like locking member having a trapezoidal cutout with the inclined sides thereof arranged for engagement with said ears and movable relative to said ears to hold said ring in its respective tightened position.

7. In combination in a lock arrangement for a mine prop having a lower prop member and an upper prop member telescopically movable in said lower prop member: an open clamping ring member having its free ends provided with a first ear and a second ear spaced from each other, said clamping ring member being connected to said lower prop member, a cylinder carried by said lower prop member and adapted to receive pressure fluid, a piston reciprocably mounted in said cylinder, a piston rod connected to said piston, a bolt extending through and in sliding engagement with said ears, said bolt being operatively connected to said piston and having a slot therethrough, the outer end of said bolt being provided with abutment means for engagement with said second ear, said cylinder having arms for engagement with said first ear, and a wedge-shaped locking member extending through said slot.

8. In combination in a lock arrangement for a mine prop having a lower prop member and an upper prop member telescopically movable in said lower prop member: an open clamping ring member having its free ends provided with a first ear and a second ear spaced from each other, said clamping ring member being connected to said lower prop member, a cylinder carried by said lower prop member and adapted to receive pressure fluid, a piston reciprocably mounted in said cylinder, a piston rod connected to said piston and to said first ear of said

clamping ring member, said cylinder being provided with arms for engagement with said second ear, a bolt slidably extending through said second ear and connected to said first ear, said bolt being provided with a slot between the outer end of said bolt and said second ear, and a wedge member having a tapered side and extending through said slot.

9. In combination in a lock arrangement for a mine prop having a first prop member and a second prop member telescopically movable in said first prop member: an open clamping ring member carried by said first prop member and adapted to be tightened to thereby clamp said prop members together in their respective relative position, said clamping ring member having its open ends provided with outwardly extending ears, a cylinder adapted to receive pressure fluid, a piston reciprocably mounted in said cylinder, a piston rod connected to said piston, and a pair of arms pivotally interconnected in a plier-like manner and having one end thereof pivotally connected to said cylinder and said piston rod respectively and having the other ends respectively in engagement with said ears for moving said ears toward each other in response to pressure fluid entering said cylinder and effecting relative movement between said cylinder



and said piston to thereby move said ears toward each other and tighten said clamping ring member.

10. A two-part mine prop comprising inner and outer telescoping members, a clamping ring carried by the telescoping end of the outer section and contractible to engage and clamp the inner section, a locking member movable to engage and lock said clamping ring in any contracted position, said locking member being biased toward locking position, and a clamping device adjustable to exert a desired force engageable with said clamping ring to contract said clamping ring into clamping engagement with said inner member so that said locking member will move into locking engagement to maintain said clamping ring in clamping engagement with said inner member.

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# UNITED STATES PATENT OFFICE

# CERTIFICATION OF CORRECTION

Patent No. 2,953,343 September 20, 1960

Wilhelm Ludwig Gustav Heusner

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, line 1, and in the heading to the printed specification, line 3, name of inventor, "Wilhelm Lüdwig Güstav Heüsner", each occurrence, read -- Wilhelm Ludwig Gustav Heusner --; in the drawings, Sheets 1 to 4, in the headings thereof, name of inventor, for "W. L. G. Heüsner", each occurrence, read -- W. L. G. Heusner --.

Signed and sealed this 25th day of April 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents