July 7, 1970 D. L. LEIBEE ET AL 3,519,091

ARRANGEMENT FOR DRILLING IN MINES

Filed Feb. 14, 1969 2 Sheets-Sheet 1

FIG-4

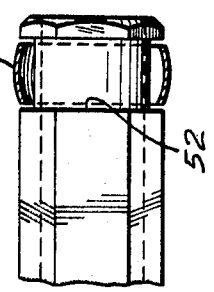


FIG-7

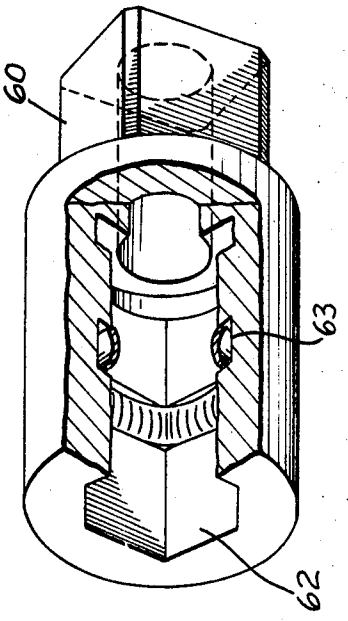


FIG-3

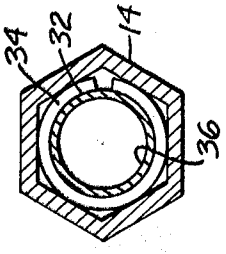


FIG-5

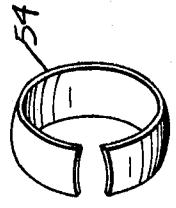
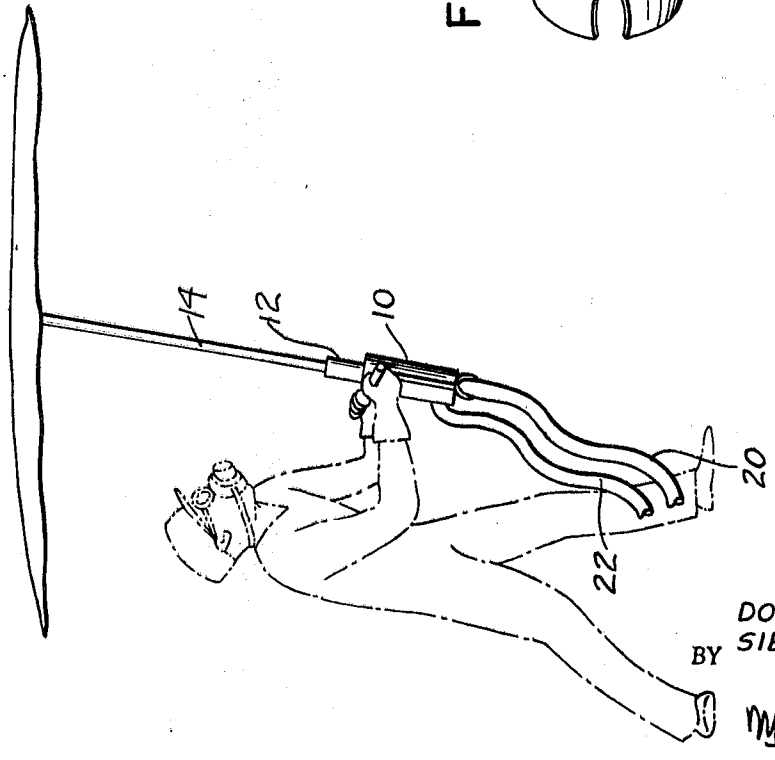


FIG-1



INVENTORS
DONALD L. LEIBEE
BY SIEBERT S. OAKS

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FIG-2

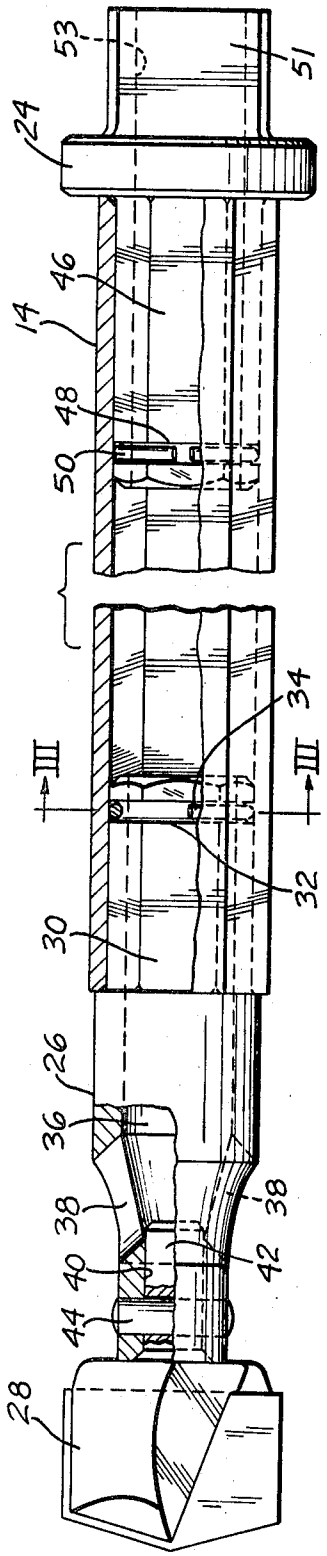
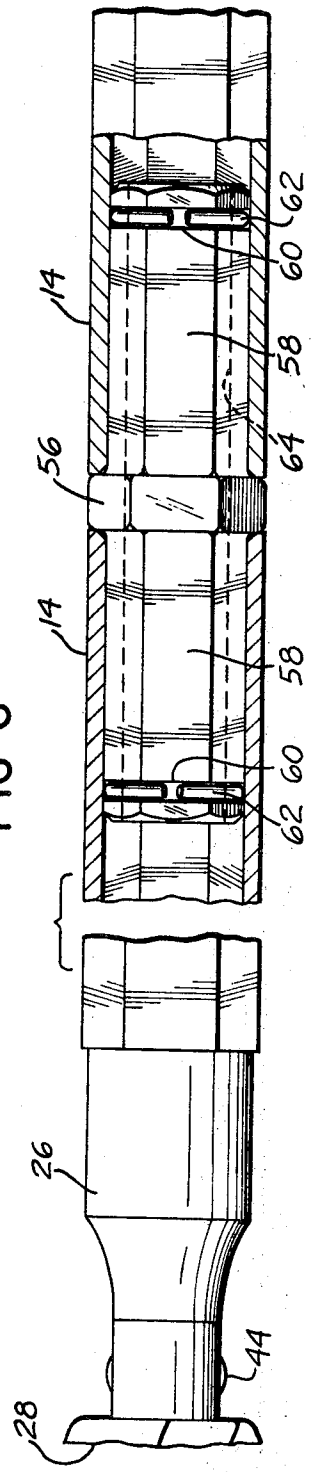


FIG-6



INVENTORS
DONALD L. LEIBEE
SIEBERT S. OAKS
BY
Melvin A. Goodman

United States Patent Office 3,519,091 Patented July 7, 1970

3,519,091

ARRANGEMENT FOR DRILLING IN MINES

Donald L. Leibee, Belfry, Ky., and Seibert S. Oaks, Everett, Pa., assignors to Kennametal Inc., Latrobe, Pa., a corporation of Pennsylvania

Filed Feb. 14, 1969, Ser. No. 799,399
Int. Cl. E21b 15/00, 17/00
U.S. Cl. 175—320 18 Claims

ABSTRACT OF THE DISCLOSURE

The invention pertains to an arrangement for making up drill strings for drilling holes in mines such as for placing charges or for drilling holes in mine roofs and is particularly characterized in the use of hexagonal tubing for the sections of the drill string with coupling members frictionally joining the tubes when placed in end to end relation and with a chuck frictionally held in one end of the tubing to receive a drill and with a driver frictionally held in the other end of the tubing for connection of the tubing with a drive motor.

The present invention pertains to a driving arrangement for driving bits and drills for drilling holes in mines. Such arrangements heretofore have employed square or round tubing and when the motor and the bit or drill had to be extended, sections of the tubing were welded together or otherwise interconnected. The welding of the tubing is objectionable because of the possibility of explosion that exists in many mine locations.

With the foregoing in mind, the present invention proposes to form drill strings of this nature from hexagonal tubing and to interconnect the parts of the drill string by a friction arrangement which eliminates the necessity of doing any welding in the mine or of carrying out laborious other types of work operations to make such connections.

By utilizing hexagonal tubing, the maximum area is provided for the flow of air through the tubing to draw dust and fines away from the drilling region while, at the same time, a good driving connection between the various members of the drill string by the use of hexagonal couplers can be made. Furthermore, the hexagonal shape is near enough to a round configuration that split ring friction connectors can be employed to retain the parts of the drill string in assembled relation.

The nature of the present invention will be more clearly understood upon reference to the following detailed specification taken in connection with the accompanying drawings in which:

FIG. 1 is a somewhat schematic view showing a drilling operation being carried out;

FIG. 2 is an elevational view partly broken away showing one arrangement according to the present invention;

FIG. 3 is a sectional view indicated by line III—III on FIG. 2 and showing more in detail the frictional connection between the chuck shank and the drive tube in which it is mounted;

FIG. 4 shows another type friction element mounted on the shank of a chuck or the like;

FIG. 5 is a perspective view showing the friction element of FIG. 4;

FIG. 6 is a view similar to FIG. 2 but showing the manner in which the drill string rod or tube can be extended by the use of a coupler and additional rod or tube; and

FIG. 7 is a perspective view partly broken away showing an adapter for coupling the drive motor to a drill.

Summary of the invention

The present invention makes up drill strings for drilling in mines by utilizing hexagonal tubing to connect a driver at the motor end of the string with a drill or bit at the other end of the string. If greater lengths are needed two or more hexagonal tubes are placed in end to end relation. The driver at the motor end of the hexagonal tube, the coupler between adjacent sections or lengths of the tube, and the bit shank, or a chuck holding the bit, are all provided with hexagonal portions which telescope the hexagonal tube, preferably on the inside, while split friction rings carried by the driver and coupler and chuck retain the drill string in assembled relation.

DETAILED DESCRIPTION

In FIG. 1 there is shown the operation of drilling holes in a mine roof. In this figure, numeral **10** represents a rotary motor, air operated, for example, and having a chuck **12** on the outer end in which is mounted a hollow rod or tube **14** terminating at its upper or outer end in a drill which is not shown.

A pressure conduit **20** supplies compressed air for driving rotary motor **10**, while conduit **22** is a suction conduit supplying suction to hollow rod or tube **14**.

In FIG. 2 there is shown an arrangement wherein rod or tube **14**, which is a hollow hexagonal member, receives an adapter member **24** at one end for connecting the tube to the chuck of the rotary motor while at its other end rod or tube **14** receives chuck **26** in which is mounted a drill of any suitable type such as the drill **28** illustrated in FIG. 2.

Chuck **26** has an hexagonal shank **30** having a relatively close fit within tube **14** and near the end of shank **30** is a groove **32** in which is mounted a split ring **34**. Split ring **34** is relatively stiff and compresses when shank **30** is pushed into tube **14** and frictionally holds shank **30** and tube **14** in assembled relation.

The chuck **26** has a bore **36** extending from the shank end into the chuck and terminating in the lateral holes **38**. Suction applied to bores **36** will draw at least the fines resulting from the drilling operation into the inside of the drilling arrangement so that it can be conducted away from the drilling region through suction conduit **22**.

The drill end of chuck **26** has a socket **40** therein of any desired shape, square or elliptical, for example, for receiving the shank **42** of drill **28**. Shank **42** is retained in socket **40** by any suitable means such as a pin **44**.

The adapter **24** also has an hexagonal shank portion **46** receivable in tube **14** and which shank portion includes a groove **48** and a split ring **50** for frictionally retaining the shank in the tube. The exposed end of the adapter **24** has a square drive shank **51** thereon for engagement with a correspondingly shaped socket in chuck **12** of motor **10**. Adapter **24** is provided with a central axial bore **53** through which suction is applied to the interior of tube **14** and therethrough to bore **36** in chuck **26**.

FIG. 4 shows how the shank of adapter **24** or chuck **26** could be formed with an elongated groove **52** for receiving a band-like split ring **54**, preferably concave inwardly in cross section. The split ring **54**, similarly to split rings **34** and **50** previously referred to, will be compressed when the shank which it carries is forced into a tube and will thereby frictionally retain the shank in the tube.

FIG. 6 shows the manner in which the hexagonal tubes **14** can be connected in end to end relation to make up a drill rod as long as desired. In FIG. 6 a coupler member **56** is employed having shanks **58** extending therefrom in opposite directions and each shank having a groove **60** for receiving a split ring **62**. Each split ring **62** could either be wire-like, as in the case of rings **34** and **50** of FIG. 2, or it could be band-like, as in the case of split ring **54** of FIGS. 4 and 5. The coupler is provided with a central axial bore **64** so that the passage for suction is continuous from the chuck end of the rod to the drive end thereof.

FIG. 7 shows a further type of adapter and which has a square shank **60** for being received in the chuck of the drive motor and having an hexagonal socket **62** in its other end of a size to receive therein hexagonal tube **14**. Any suitable means such as split friction rings or some other detent mechanism, as indicated at **63**, could be employed for holding the hexagonal tube in socket **62**. The adapter of FIG. 7 and the adapter **24** of FIG. 2 perform the same function but the adapter of FIG. 7 provides a more free passage for the flow of air through the drill rod and is thus preferred in some cases.

It is intended to comprehend within the present invention modifications and adaptations falling within the scope of the appended claims.

What is claimed is:

1. In a drilling tool, especially for mines; a rod-like member hexagonal in cross section and adapted at one end for receiving a driver operable for engagement with the chuck of a rotary drive motor and adapted for receiving a tool such as a drill or bit at the other end, said rod-like member being tubular with uniform wall thickness so as to have an hexagonal bore therethrough so that suction applied to the interior thereof at said one end will be transmitted therethrough to the other end.

2. A drill tool according to claim **1** which includes a chuck in said other end of said tubular member for supporting said tool, sai dchuck at one end having an hexagonal shank portion telescopically engaging said other end of said tubular member, said chuck at its other end having a portion telescopically engaging the shank of said tool, said chuck including passage means leading therethrough from its said other end to a region on the outer surface of the chuck near the said other end thereof whereby suction applied to said tubular member will draw drilling fines away from the drilling region and into said tubular member.

3. A drilling tool according to claim **1** in which said driver has an hexagonal portion at one end for telescopic engagement with said one end of said tubular member and a portion at the other end adapted for driving engagement with the chuck of said rotary motor.

4. A drilling tool according to claim **2** in which said shank portion of said chuck is received inside said tubular member, and a friction element on said shank portion of said chuck adapted for frictional engagement with the inner wall of said tubular member to hold said chuck and tubular member in assembled relation.

5. A drilling tool according to claim **4** in which said friction element is a split metallic ring and said chuck shank portion is formed with a groove in which said ring is mounted.

6. A drilling tool according to claim **5** in which said ring is formed of wire.

7. A drilling tool according to claim **5** in which said ring is formed of a ribbon-like strip and is concave in cross section toward the center of the ring.

8. A drilling tool according to claim **3** in which said hexagonal portion of said driver fits inside said tubular member, and a friction element on said hexagonal portion adapted for engagement with the inside of said tubular member to retain said driver and tubular member in assembled relation.

9. A drilling tool according to claim **8** in which said friction element is a split metallic ring and said hexagonal portion of said driver is formed with a groove in which said ring is mounted.

10. A drilling tool according to claim **9** in which said ring is formed of wire.

11. A drilling tool according to claim **10** in which said ring is formed of a ribbon-like strip and is concave in cross section toward the center of the ring.

12. A drilling tool according to claim **1** in which said tubular member is formed of at least two tubular elements in end to end relation, and a coupler member interconnecting said tubular elements, said coupler member having an hexagonal portion on each end telescopically engaging a respective tubular element and having an axial bore therethrough for the flow of air between said tubular elements.

13. A drilling tool according to claim **12** in which each said hexagonal portion of said coupler member fits inside the respective tubular element, and a friction element on each said hexagonal portion frictionally engaging the respective tubular element.

14. A drilling tool according to claim **13** in which each said friction element is in the form of a split metal ring and each said hexagonal portion is formed with a groove receiving the respective ring.

15. A drilling tool according to claim **14** in which each said ring is formed of wire.

16. A drilling tool according to claim **14** in which each said ring is formed of a ribbon-like strip and is concave in cross section toward the center of the ring.

17. A drilling tool according to claim **3** in which said hexagonal portion of said driver fits over the outside of said tubular member.

18. A drilling tool according to claim **17** which includes a split metallic ring in said driver for frictionally engaging the outside of said tubular member.

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JAMES A. LEPPINK, Primary Examiner