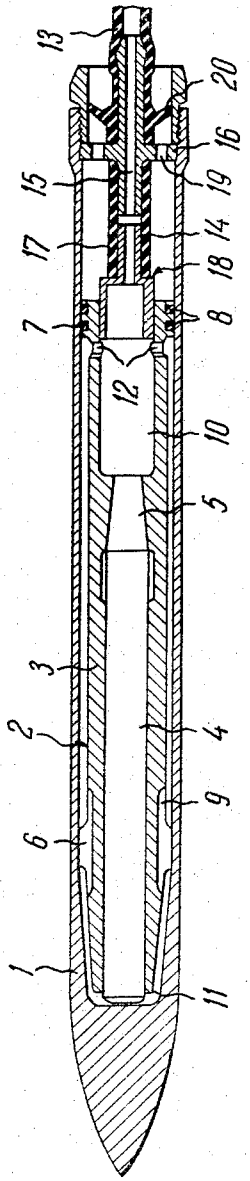
Nov. 12, 1968 B. V. SUDNISHNIKOV ET AL 3,410,354

IMPACT DEVICE FOR DRIVING HORIZONTAL HOLES IN SOFT GROUND

Filed Sept. 16, 1966



United States Patent Office 3,410,354 Patented Nov. 12, 1968

3,410,354

IMPACT DEVICE FOR DRIVING HORIZONTAL HOLES IN SOFT GROUND

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Filed Sept. 16, 1966, Ser. No. 580,014
4 Claims. (Cl. 173—125)

ABSTRACT OF THE DISCLOSURE

An impact device in which a striker acts on a body under the action of compressed air which is fed to a cavity in the rear of the striker. The striker has holes in a wall enclosing the cavity to cause retraction of the striker after the impact. A step bushing is fixed in the body to periodically close the holes in the wall of the striker and a flange with holes is secured in the rear of the body for exhausting spent air.

The present invention relates to air-driven impact devices for forming horizontal holes in soft ground, say, in subgrades of motor roads or in permanent ways of railroads.

More specifically, this invention relates to impact devices in which the striker, accelerated by compressed air, imparts a striking impact to the body of the device, thus ensuring its penetration into the ground.

Devices of such a type are known, but their extensive utilization is restricted because of numerous inherent disadvantages.

Very often on stopping the device inside a hole, it cannot be started again, and the ground has to be excavated in order to extract the device. If it proves impracticable to open the hole, e.g., in the case of a paved concrete road, the device has to be abandoned therein. Such an unreliability of the device results chiefly from the air-distributing means which does not ensure the reliable starting of the device in any position of its striker, even with the use of an additional means as a starting valve which fails to ensure the sufficient fast-response.

Frequently soil is admitted into the device and causes jamming of the striker in the body.

An object of the present invention is to eliminate the above disadvantages.

Another object of the present invention is to provide an improved air-distributing mechanism which ensures the reliable starting of the device in any position of its striker, as well as the stable and reliable operation of the device.

The air-distributing mechanism, according to the present invention, is essentially a two-stepped bushing disposed in the tail part of a body and connected to an air supply main, and to holes in the wall of a cavity in the tail part of the striker which are periodically closed with said bushing during the displacement of the striker.

It is expedient to connect the bushing, by a tubular elastic member, to a flange rigidly secured to the tail part of the body and provided with holes for expulsion of exhausted air. Such a connection of bushing to a flange makes it possible for the bushing to move somewhat with respect to the body in case of its bending when the device passes by an obstacle.

To prevent particles of soil from getting into the device, the flange is provided with an elastic valve which does not interfere with the exhaust of the used air.

Other advantages of the present invention will become more fully apparent from a consideration of the following description of an exemplary embodiment thereof, taken in conjunction with the appended drawing which shows a cross-sectional view of a device in conformity with the present invention.

A tubular body **1**, one end of which is pointed, accommodates a striker **2** composed of a sleeve **3** and a rod **4** rigidly connected to each other by means of a conical member **5**. The forming of the striker **2** as a composite unit is expedient by reason of the fact that the composite striker is considerably less rigid as compared with that made in one piece, and it imparts a smaller load to the body **1** with the same magnitude of the striking impact, thus increasing the service life thereof.

The sleeve **3** rests with its collars **6** and **7** on the inner surface of the body **1**, so that between said body **1** and said collars there is a radial clearance ensuring the free travel of the striker **2** in case of possible bending of the body **1**. The rear collar **7** is provided with packing rings **8**, whereas the collar **6** is provided with longitudinal grooves **9** to pass the compressed air.

In the tail part of the striker **2**, there is a cavity **10** formed by walls of the sleeve **3**, which periodically communicates with the working chamber **11** of the device through holes **12** in the sleeve **3**. The cavity **10** permanently communicates with the air supply main **13** through a cavity in a two-stepped bushing **14** and a duct **15** in a flange **16** rigidly secured in the tail part of the body **1**.

The bushing **14** is connected at one end to the flange **16**, whereas its opposite end is disposed in the cavity **10** to ensure periodical closing of the holes **12** during the travel of the striker **2**.

An elastic pipe **17** allows for the bushing **14** to be self-adjusted in case of bending of the body **1** when it meets large stones or cavities in its way.

On feeding the compressed air into the cavity **10**, the striker **2** begins to travel inside the body **1**, and at the end of its stroke imparts a striking impact to body **1**, resulting in advancing the body **1** into the ground.

The moment the bushing **14** opens the holes **12**, the air from the air supply main through the cavity **10** begins to fill the working chamber **11**, thus acting on the striker **2**.

Due to the difference of surface areas of the butt ends of the striker **2** acted upon by the compressed air, the striker **2** begins to travel rearwards until the holes **12** pass the edges **18** of the bushing **14**.

As soon as the holes **12** pass the edges **18** of the bushing **14**, the air in the chamber **11** will be exhausted through holes **19** in the flange. Thereafter the process is repeated.

To prevent foreign particles from getting into the device, use is made of a plate elastic valve **20** secured on the pipe **17**, which does not interfere with the exhaust of the air used in the chamber **11**.

The device is retained in the hole due to forces of friction between the body **1** and the walls of holes.

The above-said solutions of engineering problems make it possible to considerably increase the service life of the device and ensure about 500 hrs. of guaranteed operation with an impact energy of 18 to 20 kg.-m. and a frequency of impacts about 380 to 400 impacts per minute.

What is claimed is:

1. An impact device for forming horizontal holes in soft ground comprising a body, a striker slidably disposed in said body for imparting impact to said body by the action of a pressure fluid, said striker having a rear portion with a cavity and with holes in a wall enclosing said cavity; a step bushing fixed in said body and communicating with a supply of pressure fluid, said bushing being mounted in said cavity of the striker to periodically close said holes in the wall of said cavity when the striker

is displaced, a flange rigidly secured in the rear portion of said body and provided with holes for exhausting spent fluid and a tubular elastic member on said body at said flange.

2. A device according to claim 1, wherein said elastic member includes elastic valve means for preventing foreign particles from entering the body through said holes in said flange.

3. A device as claimed in claim 2, wherein said striker comprises a rod and a surrounding sleeve coupled together as a composite assembly.

4. A device as claimed in claim 3 wherein said sleeve includes collars which locally contact the body and provide radial clearance between the body and the sleeve in regions outside said collars.

References Cited

UNITED STATES PATENTS

711,859	10/1902	Holden	173—125
1,005,770	10/1911	Clark	175—92

FOREIGN PATENTS

1,000,310	1/1957	Germany.

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