July 16, 1968 F. J. KOHNEN 3,392,567

HYDRAULIC METAL EXTRUSION PRESS

Filed Aug. 18, 1965 3 Sheets-Sheet 1

FIG. 1

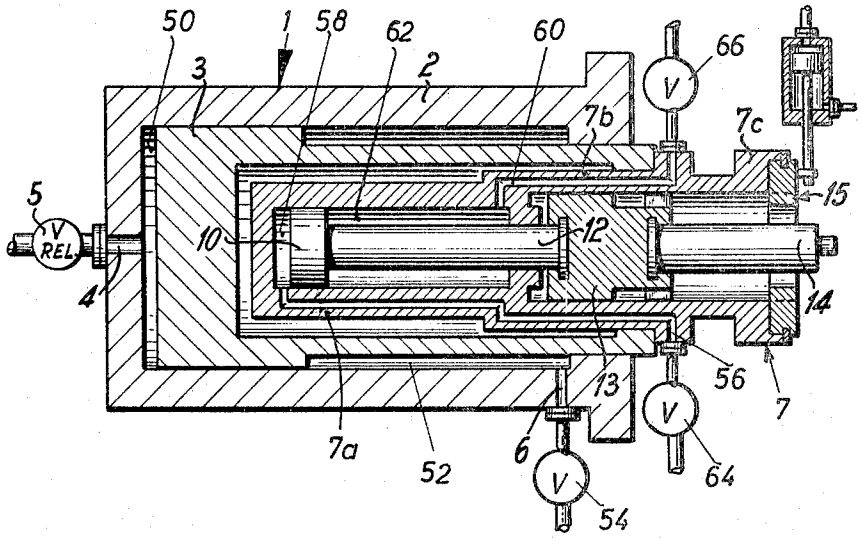
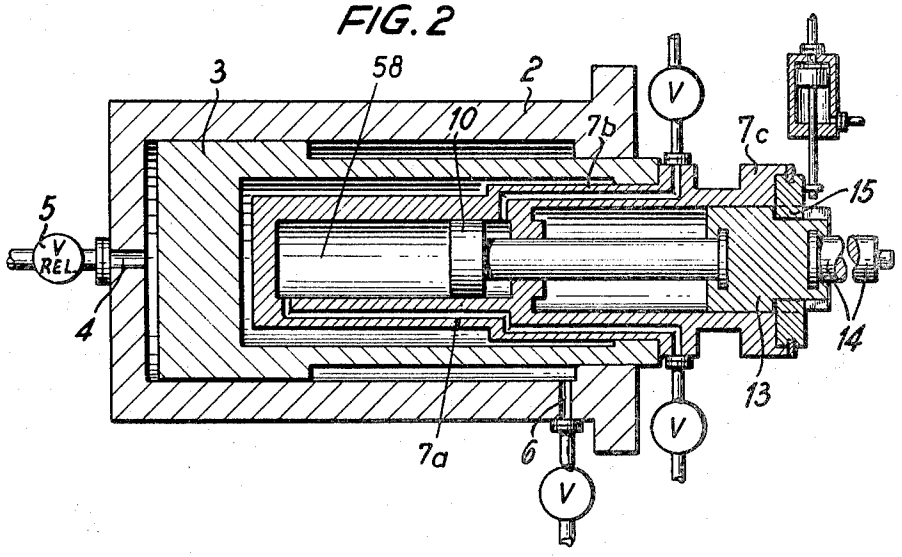



FIG. 2




INVENTOR

FRANZ-JOSEF KOHNEN

By McGlew and Toren

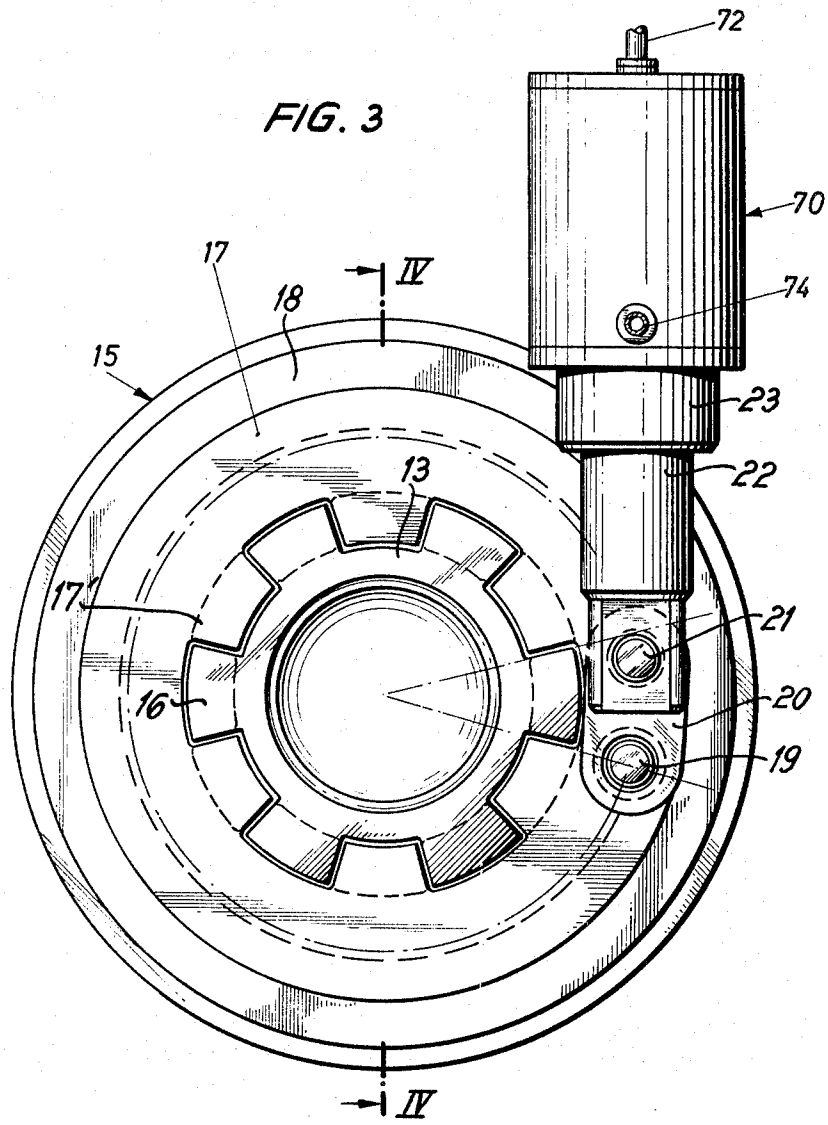
ATTORNEYS

July 16, 1968 F. J. KOHNEN 3,392,567

HYDRAULIC METAL EXTRUSION PRESS

Filed Aug. 18, 1965 3 Sheets-Sheet 2

FIG. 3




INVENTOR

FRANZ-JOSEF KOHNEN

By: McGlew and Toren

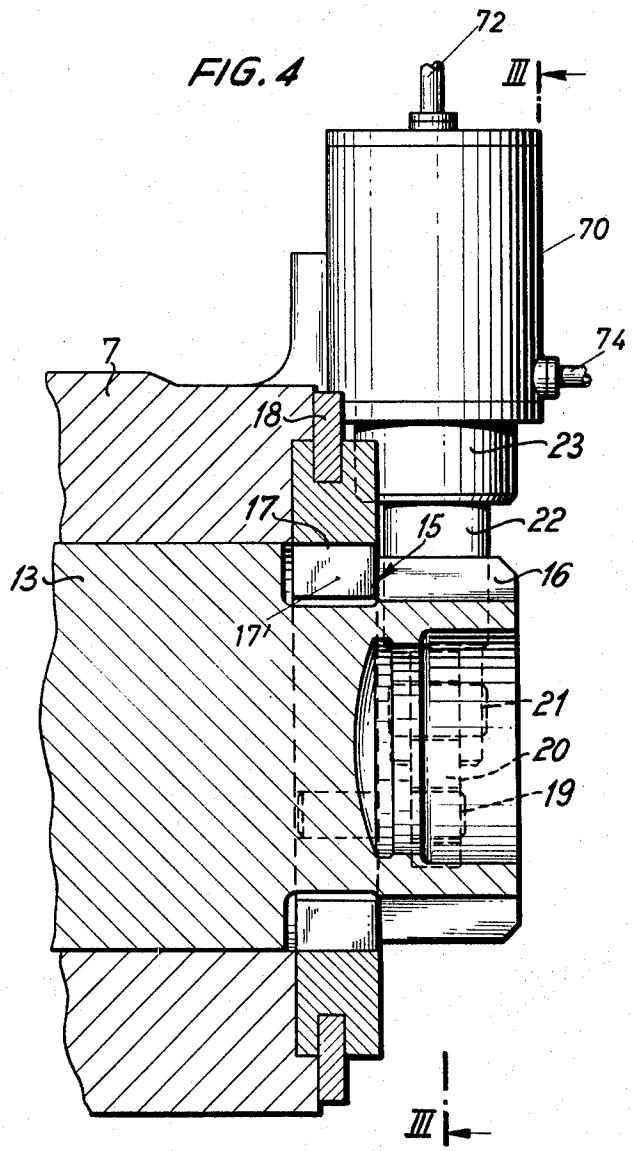
ATTORNEYS

July 16, 1968 F. J. KOHNEN 3,392,567

HYDRAULIC METAL EXTRUSION PRESS

Filed Aug. 18, 1965 3 Sheets-Sheet 3

FIG. 4




INVENTOR

FRANZ-JOSEF KOHNEN

By: McGlew and Toren

ATTORNEYS

United States Patent Office 3,392,567
Patented July 16, 1968



3,392,567

# HYDRAULIC METAL EXTRUSION PRESS

Franz Josef Kohnen, Duisburg, Germany, assignor to Hydraulik G.m.b.H., Duisburg, Germany

Filed Aug. 18, 1965, Ser. No. 480,677
Claims priority, application Germany, Aug. 18, 1964, H 53,563
3 Claims. (Cl. 72—253)

## ABSTRACT OF THE DISCLOSURE

A metal extrusion press includes a main press piston which is mounted within a main press cylinder for movement backwardly and forwardly under the control of suitable pressurizing fluid admitted to alternate sides of the cylinder. The main press piston is provided with a hollowed interior portion which receives an inner end of a head which defines a stem piston cylinder and a bore opening at one end for a stem holder. The stem holder is connected to the stem piston in a manner permitting the retractable movement thereof but not the driving movement thereof. For driving movement, the head is connected to the stem holder so that the head and the main piston together with the stem holder will move together during a pressure stroke. The means for interconnecting the stem holder to the head and the drive piston comprises a rotatable bayonet-type joint which is actuated by fluid pressure means.

This invention relates in general to extrusion presses and in particular to a new and useful hydraulic metal extrusion press having a displaceable press piston with a stem holder carried thereby which is independently movable for the subordinate movements of the stem but is adapted to be fixedly connected with the main press piston during the extrusion process.

Vertical or horizontal hydraulic metal extrusion presses of conventional construction are provided with a press stem which is permanently fixed to the main press piston and is movable therewith. This press construction is disadvantageous in that all movement to be effected by the stem must always be effected by the piston which supplies the propulsion power. When pressing with the use of a stem all movements, for example, the forward movement when the machine is empty, the loading ingot, the unloading reverse movement, the unloading and the full reverse movement must be made by the press piston. The press piston thus travels a length which is approximately six times the length of the stem. The actual press length is, however, only about one-sixth of the length traveled.

It is obvious that this unnecessary movement of the press piston at the high temperature part of the machine is uneconomical and wear of the material is thus relatively high. Because of the large mass of the piston, it is necessary to use excessive power in the supply of pressure fluid for such subordinate movements. In addition, in order to effect movements in an empty condition in a rapid manner, the main cylinder connections must be of relatively large diameter. Substantially smaller connections are required for the press stroke only.

The above considerations have led to an attempt to move the main press piston only for the press stroke and its reverse movement. It is known, for example, to swing the stem out from the central press axis position or to effect a parallel movement of the stem, but such arrangements have the disadvantage that a special ingot insertion device is required. In addition such arrangements do not result in any economies.

In accordance with the invention there is provided a



press device which includes a main press which is movable only with the main movements of the stem and the secondary movements are accomplished by means of a stem holder which is slidable relative to the main press piston. The stem holder is advantageously slidable within the main press piston, or an extension thereof, under the control of fluid pressure which is admitted to a separate pressure chamber for the control thereof. The stem holder advantageously is provided with a propulsion piston which is slidable in a separate cylindrical chamber which advantageously may be formed within the interior of the main piston. Means are provided for automatically connecting the stem holder to the main press piston for the actual pressing movement during extrusion. For this purpose the stem holder may be connected to the transverse head by means of a locking device which is preferably of interengageable bayonet-type elements which are locked under the action of suitable control.

Accordingly, an object of the invention is to provide an improved extrusion press which includes means for holding the stem so that it may be moved independently of a main press piston for subordinate movements but which is lockable with the main press piston and movable therewith during the main extrusion operation.

A further object of the invention is to provide an extrusion press which includes a relatively large size press piston and a stem holder having a piston element which is slidable in the interior of the main piston and controlled by separate fluid control for displacing the die during subordinate movements thereof and which further includes means for locking the stem holder to the main press piston for effecting the principal extrusion movement of the piston.

A further object of the invention is to provide an extrusion device which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a longitudinal section through the main press drive of a hydraulic metal extrusion press constructed in accordance with the invention;

FIG. 2 is a section similar to FIG. 1 indicating the outer or end position of the stem holder;

FIG. 3 is an enlarged end elevation of the extrusion press indicated in FIG. 1 showing the locking mechanism; and

FIG. 4 is a section taken on the line 4—4 of FIG 3.

Referring to the drawings in particular the invention embodied therein comprises a main press drive generally designated 1 for an extrusion press which comprises a main press cylinder 2 in which is slidable a differential piston or main press piston 3. One end of the cylinder is provided with an opening 4 which is connected to recoil valve means 5 for supplying fluid under pressure to the interior of the piston in the chamber 50 for effecting movement of the main press piston 3 to the right for extrusion purposes. The opposite end of the cylinder 2 is provided with a conduit 6 for admitting a fluid under pressure to a chamber 52 for moving the main press piston 3 in an opposite direction or reverse direction. A suitable valve 54 is located in the conduit 6 for controlling the fluid pressure to the chamber 52.

In accordance with the invention, a transverse head or stem cylinder generally designated 7 is affixed to the differential piston 3 and extends into a hollow bore de-

fined therein. The head **7** includes a cylindrical inner portion *7a*, an intermediate cylindrical portion or extension *7b* and an outer stem positioning portion or head *7c*. A stem holder **13** is slidable within the intermediate portion *7b* and the end or head portion *7c* and it holds a stem **14**. Subordinate movements of the stem holder **13** are accomplished in accordance with the invention under the control of a control piston or stem piston **10** which is slidable within a bore defined within the end cylindrical portion *7a*. Control fluid for displacing the control piston **10** is admitted through a passage **56** to a chamber **58** for displacing the piston **10** to the right and is admitted to a passage **60** to a chamber **62** for displacing the piston to the left. Suitable valves **64** and **66** are provided in passages **56** and **60**, respectively, for supplying fluid under pressure from a suitable source (not shown) for controlling the movement of the piston **10** and the stem holder **13** with the stem **14**. The control piston **10** includes a piston rod **12** which is secured thereto and to the stem holder **13**. The connection from the stem piston **10** and the piston rod **12** to the stem holder **13** is such as to perform the function of retracting the stem holder but not driving it.

In accordance with a further feature of the invention, at the front end of the head portion *7c* there is provided a locking device generally designated **15**. The locking device **15** permits connection of the stem holder **13** with the transverse head **7** so that the stem holder may be moved with the differential piston **3** after locking takes place.

As best indicated in FIGS. 3 and 4, the stem holder **13** is provided at its front end with circumferentially spaced teeth **16** which enable locking in the manner of a bayonet lock with teeth **17'** of an internally geared disc **17** which is affixed to the head **7** through a connecting ring **18**. In order to provide for relative rotation of the parts **13** and **18** to effect interengagement of the teeth **16** and **17**, there is provided a piston rod **22** which is connected to a piston member **23** which is slidable in a fluid cylinder **70** under the control of fluid pressure which is admitted through control lines **72** and **74**. The piston rod **22** is connected to the head **7** and to the lock disc **17** by means of a pin **19** and a joint member **20**. Reciprocation of the piston **23** causes rotation of the disc **17** and the interengaging of the teeth **16** when movement of the differential piston **3** is to be effected. In a similar manner the teeth **16** and **17'** may be disengaged.

The stem holder **13** and the transverse head **7** which is connected to the main or differential piston **3** are locked together by the locking device **15** only for the duration of the actual press work and for the retraction. The stem holder **13** is secured against displacement during the locking process and during pressing by means such as a locking pawl (not shown) when the locking operation takes place.

The press construction in accordance with the invention has the following advantages:

(1) The main press cylinder and the main press piston are shorter by approximately 50% of the stroke of conventional presses which means reduction of weight and cost. The over-all length of the press is reduced.

(2) A rapid-drive piston for the idle stroke which is required when not using a filling container may be eliminated.

(3) When pressing with a stem such as stem **14**, the main press piston travels only one-sixth of the customary distance. This extends the life of the equipment and wear and tear is reduced accordingly.

(4) The life of the main pumps will be longer.

(5) The filling valve can be replaced by considerably less expensive recoil valve.

(6) The danger of destroying the ingot loading device by the main press is eliminated.



(7) The secondary speeds of the main press drive may be higher in view of the small quantities of masses to be moved.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

I claim:

1. A hydraulic metal extrusion press comprising a main press cylinder, a main press piston axially slidable in said main press cylinder, a head affixed to said main press piston defining an inner stem cylinder and having a bore therein, which is open at one end for the passage of a stem therethrough, a stem holder axially movable in the bore of said head, a stem piston connected to said stem holder and axially movable in the stem cylinder of said head for displacing said stem holder independently of said main press piston, fluid pressure means admissible to said main press cylinder for controlling the movement of said main press piston and admissible to said stem cylinder for controlling the movement of said stem holder independently of said main press piston, and locking means carried by said stem holder and said head for locking said main press piston and said head to said stem holder for movement together.

2. A hydraulic metal extrusion press comprising a main press cylinder, a main press piston axially slidable in said main press piston, said main press cylinder having a hollow interior, means for mounting a stem for movement in the hollow interior of said main press piston, fluid pressure means for controlling the movement of said main press piston and for controlling the movement of said stem holder independently of said main press piston, and locking means for locking said main press piston to said stem holder for movement together including an internally toothed ring carried by said head, said stem holder having projecting teeth engageable with the teeth of said head in a bayonet fashion.

3. A hydraulic metal extrusion press comprising a main press cylinder having a hollow cylindrical inner portion and an outer hollow head portion, a main press piston axially slidable in said main press cylinder, said main press piston having an inner hollow interior portion and an outer head portion with a base opened at one end, means mounting a stem for movement in the bore of said head portion including a stem holder axially movable in the bore of said head portion, a piston connected to said stem holder and axially movable in the inner hollow interior portion for displacing said stem holder independently of said main press piston, fluid pressure means admissible to said main press cylinder for controlling the movement of said main press piston and admissible to said inner hollow interior portion for controlling the movement of said stem holder independently of said main press piston, locking means for locking said main press piston to said stem holder for movement together including an internally toothed ring carried by said outer head portion, said stem holder having projecting teeth engageable with the teeth of said head in a bayonet fashion, and means for rotating said stem holder and said outer head portion relatively for interengaging the teeth on said ring and said stem holder for locking said stem holder to said outer head portion and to said main piston.


**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,903,130 | 9/1959 | Reichl | 72—263 |
| 3,074,549 | 1/1963 | Kent | 72—265 |



CHARLES W. LANHAM, *Primary Examiner.*

K. C. DECKER, *Assistant Examiner.*