Sept. 28, 1965 T. A. DEAKINS ETAL 3,208,114

APPARATUS FOR EXTRACTING AND HANDLING CAST ELONGATED ARTICLES

Filed Aug. 20, 1962 2 Sheets-Sheet 1

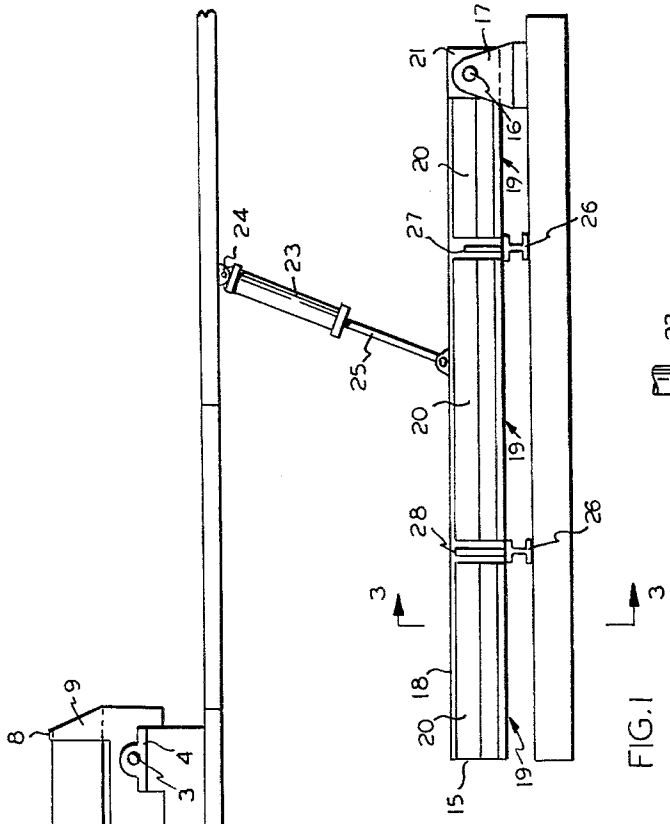


FIG. 1

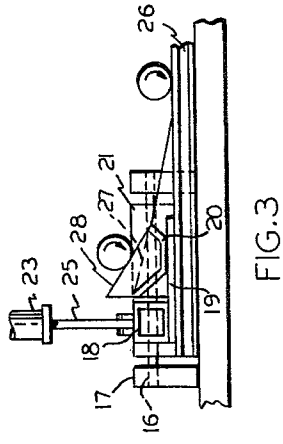


FIG. 3

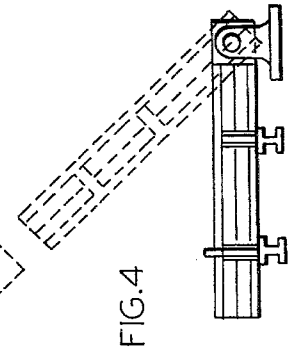
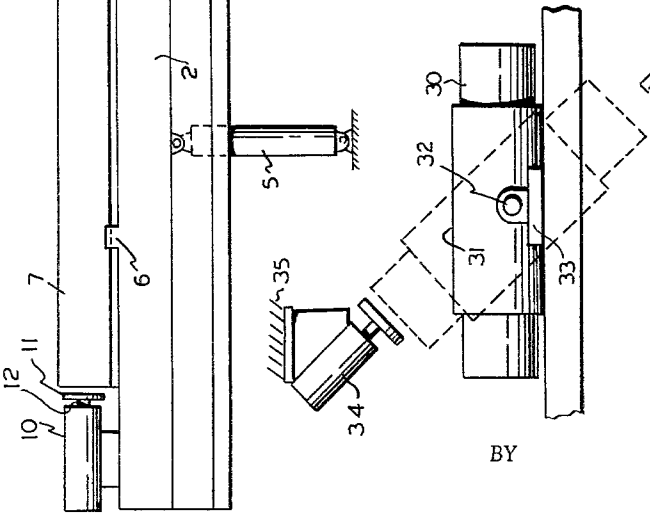


FIG. 4



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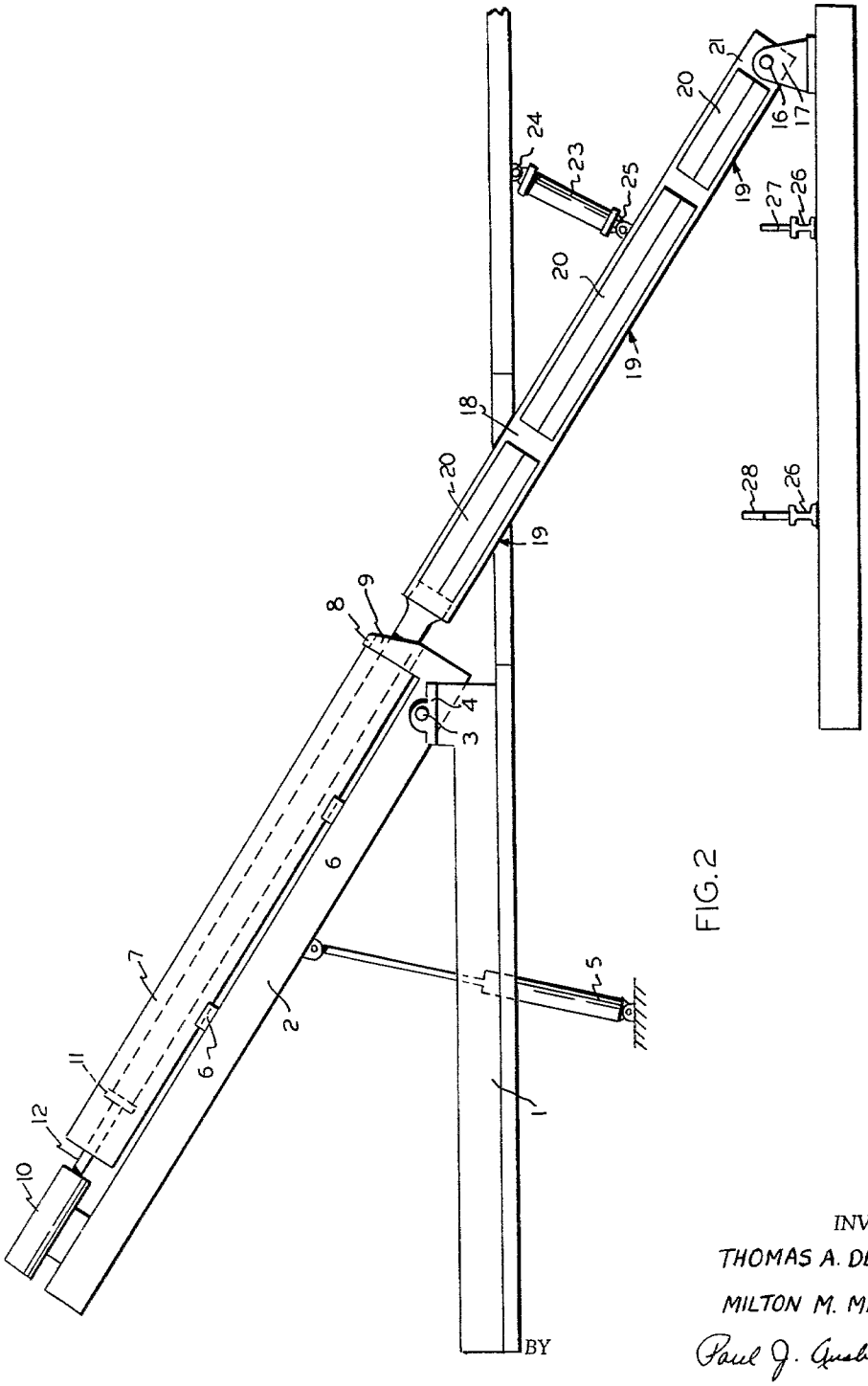


FIG. 2

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United States Patent Office 3,208,114 Patented Sept. 28, 1965

3,208,114

APPARATUS FOR EXTRACTING AND HANDLING CAST ELONGATED ARTICLES

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Filed Aug. 20, 1962, Ser. No. 217,999
2 Claims. (Cl. 22—94)

This invention relates to pipe casting apparatus and more particularly it relates to improved means of extracting a pipe from the mold in which it was cast.

A common method of extracting a pipe from a mold comprises raising the mold from the horizontal position in which the pipe was cast to a position wherein its longitudinal axis is vertical. The pipe is ejected out of the lower end of the mold into a space provided below. It is necessary to control the descent of the pipe to prevent its damage. At this time the pipe is very hot and is in the early stages of solidification so that it is particularly susceptible to impact damage. To prevent the pipe from falling on its end with sufficient impact to damage the pipe, it has been found necessary to provide a cushioned surface for the pipe to fall onto or, as is sometimes done, to lower the pipe from the mold by means of an elevator. After the pipe is ejected downward it is again very important that it does not fall from the vertical position in an uncontrolled manner as free falling pipe will strike with sufficient force to cause damage. Elaborate means have been used for carefully lowering the pipe to the desired horizontal position without damage. It is readily apparent that the longer the pipe section the more magnified are these problems of extracting and handling the pipe in the vertical position.

It is also known practice to utilize various apparatus to remove the casting from the mold while it is in the horizontal position. Such horizontal acting means as a long stroke fluid cylinder for pushing the pipe from the mold or a track mounted means for pulling the casting out of the mold are known. This type of apparatus has the advantage that the pipe is extracted in the horizontal position, however, such equipment is expensive and the maintenance costs are high. Here again it is apparent that extraction problems increase as the length of the pipe section increases.

This invention has for its object the provision of an improved extraction apparatus for ejecting a pipe from the mold in which it was cast, receiving the pipe as it is ejected from the mold and placing the pipe in a horizontal position.

This invention has for its object the provision of an improved extraction apparatus which is simple in construction and operation and which causes a minimum of impact damage to the hot pipe.

A further object of the invention is the provision of an extraction apparatus which is particularly useful when extracting long lengths of pipe.

Another object of the invention is the provision of an improved method for extracting and handling a cast elongated article.

Other details, objects and advantages of the invention will become apparent from the following description taken in conjunction with the drawings in which:

FIGURE 1 is a side elevation of the apparatus for extracting a pipe from a mold, the mold tilting means and pipe chute being shown in their normal, inactive position.

FIGURE 2 is a side elevation of the apparatus of FIGURE 1 showing the mold tilting means and pipe chute in operative position.

FIGURE 3 is a cross section of the pipe chute taken along line 3—3 in FIGURE 1.

FIGURE 4 is a modification of the invention wherein the casting and extraction operations take place at the same station.

The apparatus as illustrated in the presently preferred embodiment of FIGURE 1 comprises, at an upper level, a support **1** on which is mounted a cradle **2**. The cradle is tiltably mounted on the support by means of trunnions **3** on each side of the cradle which are mounted in bearings **4**. The cradle may be tilted by means of hydraulic cylinder **5** which is pivotably mounted at each end so that an upward push on the cradle will result in rotation of the cradle **2** about trunnions **3**.

The cradle **2** is provided with suitable blocks or wedges **6** to maintain a cylindrical mold **7** in a stationary position in the cradle. At the end of the cradle which is the lower end when it is tilted there is provided a stop plate **8** which prevents the mold from sliding from the cradle when it is tilted. An opening **9** is provided in the stop plate to permit the pipe, and mold sand if a sand mold is used, within the mold to be discharged downward. A short stroke hydraulic cylinder **10** which serves as an ejection means is mounted at the opposite end of the cradle in generally axial alignment with the mold. A push-out plate **11** is provided on the end of the piston rod **12**. This plate is larger than the inside diameter of the pipe so that, as is shown in FIGURE 2, it may be used to push against the end of the pipe to start the pipe moving from the mold.

At a lower level, a pipe catcher **15** is mounted by means of trunnions **16** in bearings **17** so that it is rotatable about one end. Referring to FIGURES 1–3 it can be seen that the pipe catcher consists of a main beam **18** to which are attached three spaced apart supports **19**. Attached to each of the supports **19** is a chute segment **20** and these three segments are aligned, although spaced apart, so as to be effective as one continuous chute. The main beam **18** is fixed at one end to a cross beam **21** which is secured to a rod that projects beyond each end of the cross beam so as to form trunnions **16**. The trunnions **16** are rotatably mounted in bearing supports **17** and the whole assembly can be tilted to the inclined position indicated in chain lines by means of hydraulic cylinder **23**. The hydraulic cylinder is pivotably mounted to the main beam **18** at one end and a fixed support **24** at the other end so that withdrawal of the piston rod **25** into the cylinder **23** results in the pipe catching means **15** rotating about trunnions **16**.

When the pipe catcher **15** is in its normal, inoperative position, as shown in FIGURE 1, the main beam **18** rests on two rails **26**. At the points where the rails **26** pass under the pipe catcher, the supports **19** and chute segments **20** are spaced apart. Attached to the top surface of rails **26** are wedges **27** and **28**, and these wedges project upward into the spaces between the segments of the chute **20**. In FIGURE 3 the difference in the shape of the two wedges is shown. The wedge **28** has an initial portion of steeper slope than the wedge **27** so that both will make contact with a pipe in chute **20** at about the same instant when the pipe catching mechanism is lowered over the wedges.

In operation, the mold **7** is delivered from a remote casting station to cradle **2**. Hydraulic cylinder **5** is extended so as to rotate the cradle about trunnions **3** until it is in the inclined position shown in chain lines. The angle of tilt is generally near 45°, but this may be varied as needed to accommodate the equipment to the space available or to increase or decrease the rate at which the casting slides from the mold. The mold is prevented from rolling off the side of the cradle by blocks **6**, and as the mold tilts the stop plate **8** prevents the mold from slipping longitudinally from the cradle **2**.

At the same instant that cradle **2** is being tilted, the pipe pipe catcher **15** is moved into proper position to

catch the pipe as it is ejected from the mold. Hydraulic cylinder **23** is activated so as to pull the free end of the pipe catcher upward until it is in proper alignment with the tilted cradle **2**. When both the cradle **2** and pipe catcher **15** are in proper position, as shown in FIGURE 2, hydraulic cylinder **10** is activated and as piston rod **12** extends, push-out plate **11** pushes against the end of the pipe in the mold. This starts the pipe moving downward in the mold. Once the pipe is put into motion in this manner it continues to move downward under the force of gravity provided the angle of tilt is sufficient to offset frictional forces.

Stop plate **8** prevents the mold from moving with the pipe and the opening **9** is provided to permit the passage of the pipe through the stop plate. The pipe leaves the mold and enters chute **20** which guides its downward movement. Controlled fall of the pipe is assured so long as the angle of tilt is kept considerably less than 90°. As the head end of the pipe reaches the bottom of the chute, the motion of the pipe is arrested by cross beam **21** and the pipe comes to rest in chute **20**.

When the pipe has been ejected from the mold, push-out plate **11** is withdrawn from the end of the mold and the cradle **2** is brought to its normal, inactive position. The empty mold is then removed from the cradle **2** and returned to the casting station. The extraction station is then ready to receive another mold containing a pipe.

The pipe catcher **15** is also lowered to its normal, inactive position and as it approaches this position, wedges **27** and **28** enter the slots provided between the spaced apart chute segments **20**. As the chute is lowered over these wedges, they make contact with the pipe in the chute and the pipe is held in an elevated position while the chute is dropped below the pipe. The pipe is then free to roll down the inclined face of the wedge onto rails **26**. The wedge **28** is made higher than wedge **27** so that the inclined pipe will make contact with both wedges at about the same instant thus preventing any erratic movement of the pipe in the chute. The rolling of the pipe down the wedges is illustrated in FIGURE 3.

FIGURE 4 illustrates a modified form of the invention in which the pipe is cast and extracted from the mold at the same station. In this apparatus the mold **30** is rotatably mounted in a cradle **31** by bearing means, not shown. The mold is rotatably mounted in cradle **31**, but it is also fixed against longitudinal movement in the bearings, thus when the cradle **31** is tilted by rotation about trunnions **32** which are mounted in fixed bearing blocks **33** the mold is held in the cradle. The pipe may be ejected by a suitable means, for example, a hydraulic cylinder **34** mounted on a fixed overhead support **35**. Also the hydraulic cylinder could be supported by the cradle **31**, or in lieu of such means, the pipe could be broken loose by jarring the mold. In all other respects, the extraction apparatus is similar to that illustrated in FIGURE 1.

While there have been shown and described certain present preferred embodiments of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise embodied and practiced without departing from the scope of the following claims.

We claim:

1. Apparatus for extracting and handling a cast elongated article comprising a cradle for supporting a generally cylindrical mold containing the cast article in a generally horizontal position, the cradle being pivotally mounted, means for pivoting the cradle to a position wherein a supported mold has its longitudinal axis inclined to the horizontal at an angle of around 45°, a hydraulic cylinder mounted on the cradle adjacent the upper end of and axially aligned with the longitudinal axis of a supported mold, a push-out plate mounted on the hydraulic cylinder, a transversely slotted chute positioned to receive a pipe as it is ejected downwardly axially from an inclined mold supported on the cradle, the chute being pivotable between a generally horizontal position which is lower than said cradle to an inclined position adjacent to and aligned with the lower end of a mold supported in an inclined position by the cradle so that an article ejected from the mold enters and slides down the chute, a cross member at the lower end of the inclined chute for arresting the downward movement of the ejected pipe in the chute when it is completely free from and inclined at substantially the same angle as the mold, wedges indexing with said transverse slots as the chute is lowered to its horizontal position whereby the pipe in the chute is raised from the chute and is free to roll down the inclined surfaces of the wedges, and means for pivoting the chute between said horizontal position and said inclined position.

2. Apparatus for extracting and handling a cast elongated article comprising a cradle for supporting a mold containing the cast article, the cradle being pivotable between a substantially horizontal position and an inclined position, means for pivoting the cradle to a position wherein it is inclined at an angle of approximately 45°, ejection means mounted so as to be adjacent the upper end of a mold supported on the cradle in said inclined position, a transversely slotted chute for receiving the article as it is ejected axially downward from a mold supported in an inclined position by the cradle, the chute being pivotable between a horizontal position lower than the horizontal position of the cradle and an inclined position where it is adjacent to and aligned with the lower end of the inclined cradle so that the article enters and slides down the chute as it is ejected from the mold, means for arresting the downward motion of the ejected article in the chute when it is completely free of the mold, wedges indexing with the transverse slots in the chute when the chute is moved to said horizontal position lower than the horizontal position of the mold whereby the pipe is removed from the chute as the chute is lowered over the wedges, and means for pivoting the chute between the inclined position and the horizontal position.

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