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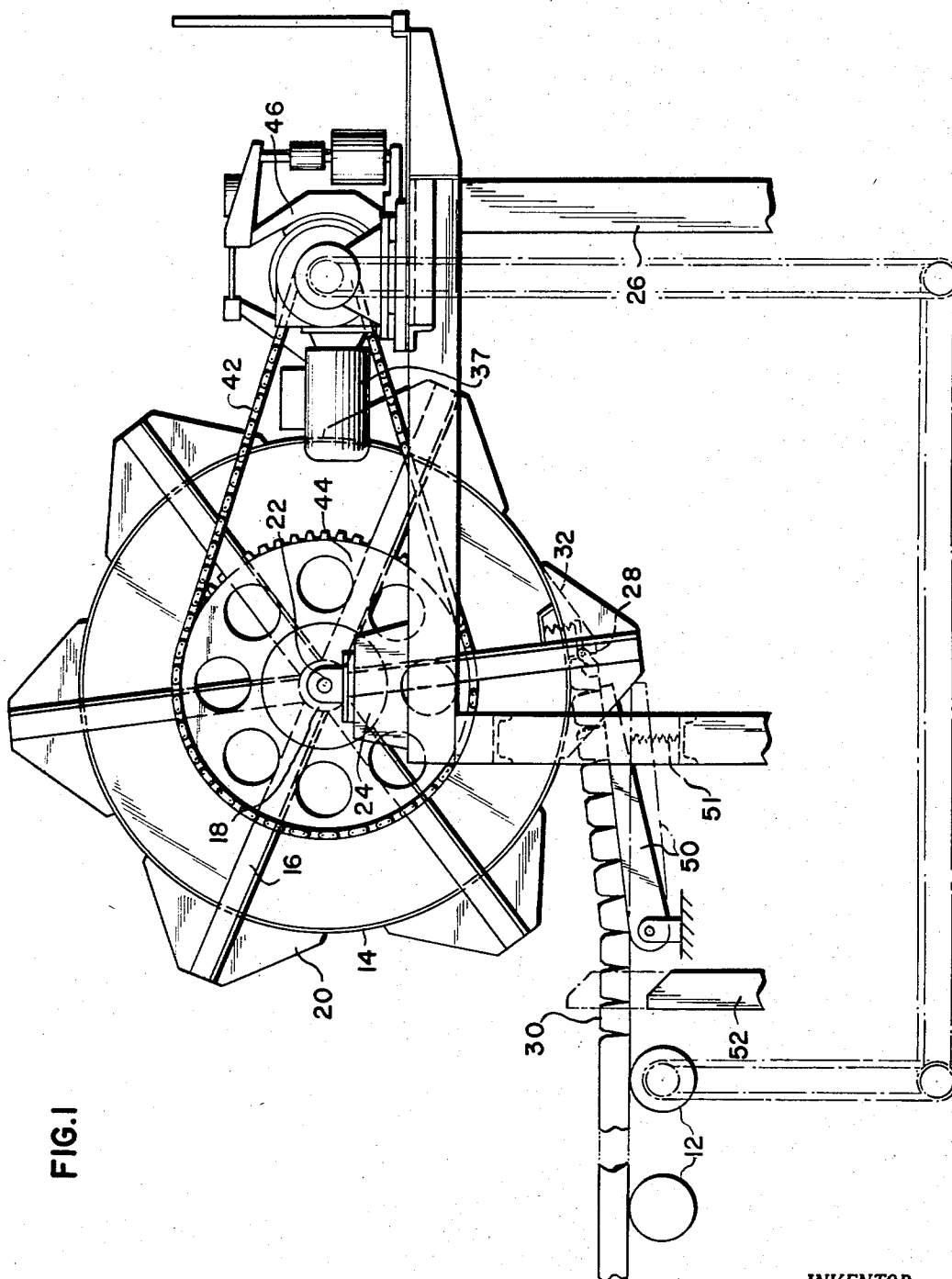
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STORAGE APPARATUS FOR DUMMY INGOTS

Filed Nov. 22, 1965

2 Sheets-Sheet 1



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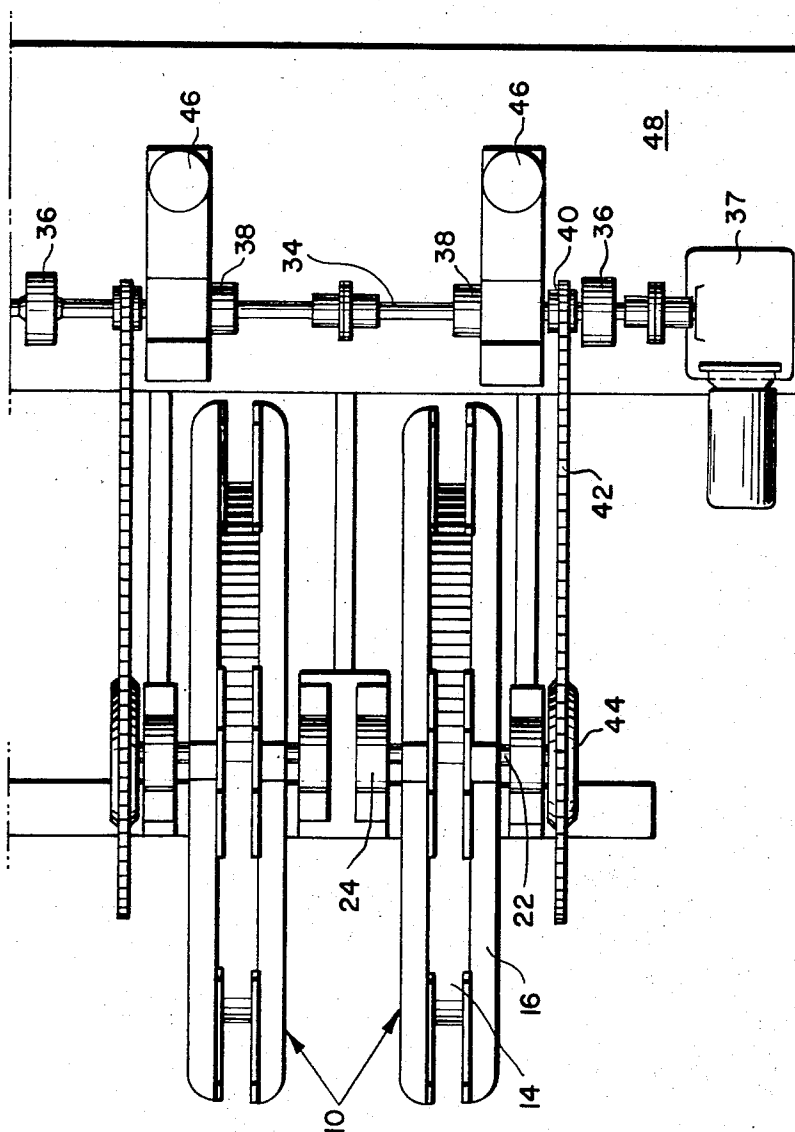
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FIG. 2



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STORAGE APPARATUS FOR DUMMY INGOTS

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995,920

4 Claims. (Cl. 164—274)

ABSTRACT OF THE DISCLOSURE

A dummy ingot which plugs the bottom of a curved ingot mold at the beginning of each continuous ingot casting run consists of individual rigid elements connected by a pliable connecting member, and is wound on and unwound from a drum mounted on a frame above the conveyor which carries ingots from the mold, thus permitting storage of the dummy ingot near the conveyor without additional spaced requirements and permitting easy handling of the dummy ingot.

This invention relates to the continuous casting of metal ingots, and particularly to apparatus for storing dummy ingots of the type employed with continuous casting machines having a curved mold.

Dummy ingots are employed in casting machines of the afore-mentioned types for plugging the ingot mold before casting starts, and for drawing the string of cast material over a roller track to the pull rolls. The dummy ingot thus must be of a length sufficient to enable one of its ends to be engaged by the pull rolls while the other end plugs the ingot mold. The usual dummy ingots thus are of a very substantial length, particularly those employed in the casting of blooms and slabs, and the conventional storage arrangements for such dummy ingots are of corresponding size.

It is necessary to lift the dummy ingot rapidly from the path of the cast metal, usually at the end of the horizontal conveyor for the cast material, and to store it during the casting run, and again engage it in the pull rolls which introduce it into the casting machine before the next casting run. In the interest of rapid operation it is necessary, therefore, to store the dummy ingots between two successive runs in the immediate neighborhood of the casting machine, and it is desirable that their transfer between storage and the pull rolls be performed automatically.

It is known to tilt the dummy ingot on the roller track leading away from the casting machine, and to drop it laterally from the roller track so that it may be stored at the side of the track. It has also been proposed to lift the dummy ingot and to store it overhead above the roller track.

The various storage devices for dummy ingots employed up to now require relatively complex devices for removing the ingot from the roller track, and often increase the space requirements of the casting installation in the direction of material travel on the roller track beyond the pull rolls by the approximate length of the dummy ingot. In some steel works utilizing previously existing buildings of elongated rectangular shape, it is not possible for this reason to install continuous casting machines for discharge of ingots in the direction of width of the building.

The primary object of the invention is an improvement in continuous casting machines of the described type, which results in a substantial reduction of the required space.

Another object is an improvement in the storage of dummy ingots, permitting the ingots to be stored effec-

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tively and conveniently without the use of complex machinery.

According to this invention, the dummy ingot is trained over a drum at the discharge end of the casting machine just beyond the pull rolls, and is either stored while wound on the drum or deflected by the drum toward any other storage device in any desired direction.

Other features, further objects and many of the advantages of this invention will be readily appreciated as the same becomes better understood from the following detailed description of a preferred embodiment when considered with the appended drawing in which:

FIG. 1 shows a portion of continuous casting machine equipped with the dummy ingot storage device of the invention in side elevation; and

FIG. 2 shows the apparatus of FIG. 1 in plan view.

Referring now to the drawing in detail, there are shown two drums 10 respectively mounted at the ends of two roller tracks 12 which are elements of a continuous casting machine, not otherwise shown, and normally carry a continuous ingot from the dual ingot molds of the machine past a cutting station where the continuous length of metal is cut into ingots, blooms or slabs in a manner well known in itself, and not illustrated.

Each drum 10 has a rim 14 which is secured on a hub 18 by radial beams 16. Flange elements 20 fastened on the ends of the beams 16 project radially beyond the rim 14 axially to retain a dummy ingot wound on the cylindrical face of the rim 14. The hub 18 is fixedly fastened on shaft 22. The shaft of each drum 10 is mounted between two bearings 24 on a common supporting frame 26.

A spring loaded catch is mounted on one of the flange elements 20 for fastening the free end of dummy ingot 30 to the drum 10, as best seen in FIG. 1. A wedge-shaped cam 32 mounted on the flange element 20 behind the catch 28 protects the latter and facilitates the winding of the dummy ingot on the drum 10 in several radially superimposed turns.

The dummy ingot 30 consists of rigid metal blocks aligned in a long row of longitudinally connected by a flexible web. Such a dummy ingot has been described in more detail in the French Patent No. 1,421,502.

The several drums 10 are driven by a common drive shaft 22 consisting of several flangedly connected sections, and mounted in bearings 36. A gear motor 37 is coupled to the drive shaft 34. Each drum 10 may be individually connected to the drive shaft 34 by a clutch 38 whose driven or input member is fixedly fastened to the shaft. The driving or output member of each clutch is fixedly connected with a small sprocket 40 which freely rotates on the drive shaft 34, and is connected by a chain 42 with a larger sprocket 44 keyed to the drum shaft 22. A jaw brake 46, best seen in FIG. 1, is engageable with each clutch output member, and thus permits the corresponding drum 10 to be stopped in any desired angular position.

The entire drive mechanism is mounted on a platform 48 which is fixedly secured to the frame 26.

Deflector plates 50 are provided at the end of each roller track 12 whose individual rollers are driven by a non-illustrated gear train connected to the motor 37 in such a manner that the circumferential speed of the track rollers 12 is equal to the circumferential speed of the cylindrical face of the drum rim 14.

One end of each plate 50 is pivoted to the frame 26 for movement about an axis which is parallel to and slightly below the plane of support defined by the tops of the several rollers in the track 12. The top face of the plate 50 intersects this plane, and the free end of the deflector plate 50 is urged upwardly toward the drum 10 by a strong helical compression spring 51.

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An abutment bar 51 is slidably mounted on frame 26, in a manner not shown in detail, for vertical movement between the fully drawn retracted position, and an operative position indicated by broken lines. The solenoid which shifts the bar 52 into the operative position when energized has not been illustrated since it may be entirely conventional, and the drawing also does not show the conventional electrical actuators for the clutches 38 and the brakes 46, nor the limit switches which control such actuators, and whose position and connection will be obvious from the following description of the mode of operation of the illustrated device.

When the casting machine is ready for pouring a batch of metal, the gear motor 37 is started while the clutches 38 are disengaged, and the brakes 46 are applied to hold the drums 10 in the position illustrated in FIG. 1 in which the flange element carrying the catch 28 is in its lowermost position and near the deflector 50.

The dummy ingot is detached from the cast material of the preceding run, and its free end traveling on the roller track 12 abuts against the bar 52 while the same is in its operative position. A suitably placed switch may respond to the abutting engagement either to start automatic operation of the apparatus, or generate an audible or visible signal to alert an operator who may then manually operate the apparatus.

The bar 52 is withdrawn and the dummy ingot is pushed by the roller track over the deflector plate 50 until its free end engages the catch 28. A pressure sensitive switch located on the catch may thereupon cause the release of the brake 46 and the engagement of the clutch 38 whereby the drum 10 starts turning, and the dummy ingot 30 is wound on the drum face. When the ingot is fully wound on the drum 10, the clutch 38 is disengaged and the brake 46 is again applied. A switch responsive to a preset number of turns of the drum 10 may be employed in a known manner to arrest the drum 10. The arrangement is preferably such that the tail end of the dummy ingot 30 is still on the deflector plate 50 when the drum 10 stops. This greatly facilitates subsequent unwinding of the dummy ingot.

The motor 37 is reversible, and is energized to turn the drum 10 counterclockwise, as viewed in FIG. 1, when the next casting run is to be prepared for. Since the roller track 12 is also driven by the motor 37, the rollers assist in conveying the dummy ingot from the drum 10 toward the ingot mold. The tail end of the ingot is soon engaged by the pull rolls of the ingot machine, not themselves seen in the drawing, and is ultimately introduced into the ingot mold to plug the same. The catch 28 may then be released manually if so desired, or it may be provided with a solenoid-actuated release mechanism in circuit with the afore-described switch that is coupled

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to the drum 10, and responds to its rotation. The drum 10 is again arrested in the position shown in FIG. 1, and a new cycle of operations may be started.

It should be understood, of course, that the foregoing disclosure relates only to a preferred embodiment of the invention, and that it is intended to cover all modifications of the example of the invention herein chosen for the purpose of the disclosure which do not depart from the scope and spirit of the attached claims.

What is claimed is:

1. A storage apparatus for flexible dummy ingots in a continuous casting installation comprising, in combination:

- (a) frame means;
- (b) a drum rotatably mounted on said frame means and having a cylindrical face;
- (c) conveying means for conveying a dummy ingot toward said face;
- (d) releasable fastening means on said drum for fastening the free end of an ingot to said face when the ingot is being conveyed by said conveying means; and
- (e) drive means for rotating said drum in a direction for winding a fastened ingot on said face.

2. An apparatus as set forth in claim 1, wherein said conveying means include a plurality of support members arranged to define a plane of support radially spaced from said face, and deflector means for deflecting a dummy ingot supported by said support members from said plane toward said face.

3. An apparatus as set forth in claim 2, wherein said deflector means include a deflector member having two spaced terminal portions, one terminal portion of said deflector member being pivotally mounted on said frame means, and yieldably resilient means urging the other terminal portion of said deflector member to move in a direction from said plane toward said face.

4. An apparatus as set forth in claim 1, further comprising an elongated dummy ingot on said conveying means, said dummy ingot having a longitudinal end portion fastened to said drum by said fastening means.

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