Nov. 19, 1968 A. MUSSCHOOT ET AL 3,411,171

MATERIAL HANDLING APPARATUS

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FIG. 1.

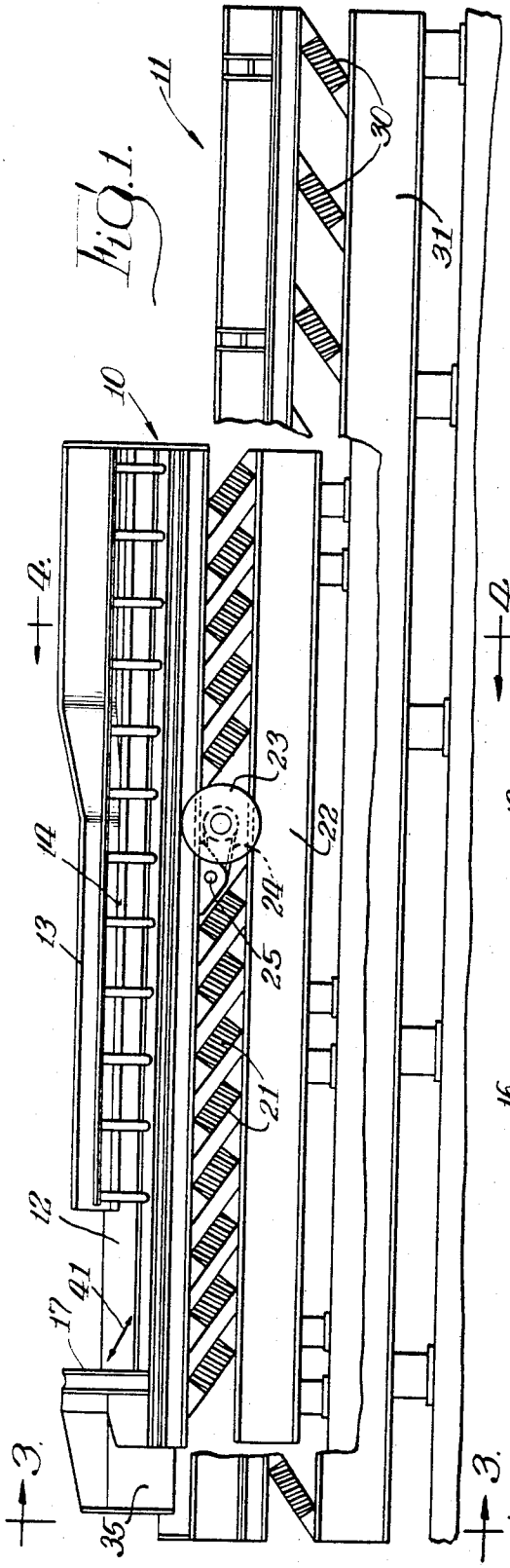
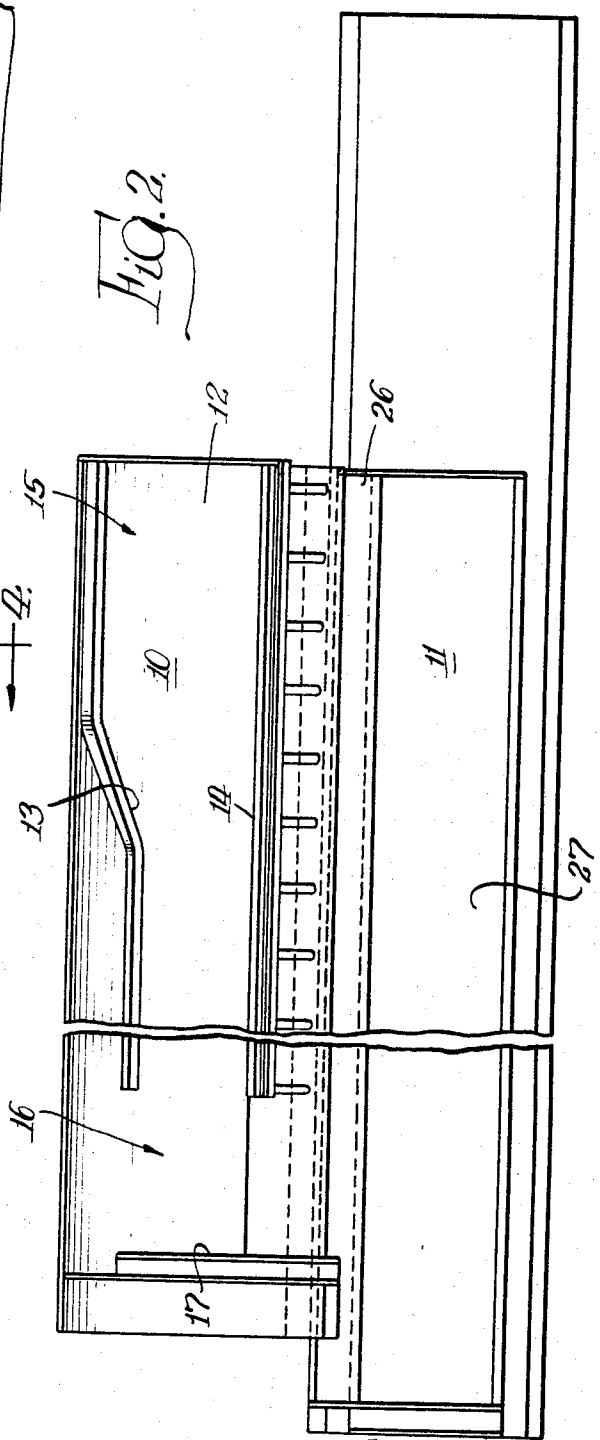


FIG. 2.



Inventors:
Albert Musschoot
Marvin G. Thomson
By Hofgren, Wegner, Allen, Stellman & McCord Attys.

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Fig. 3.

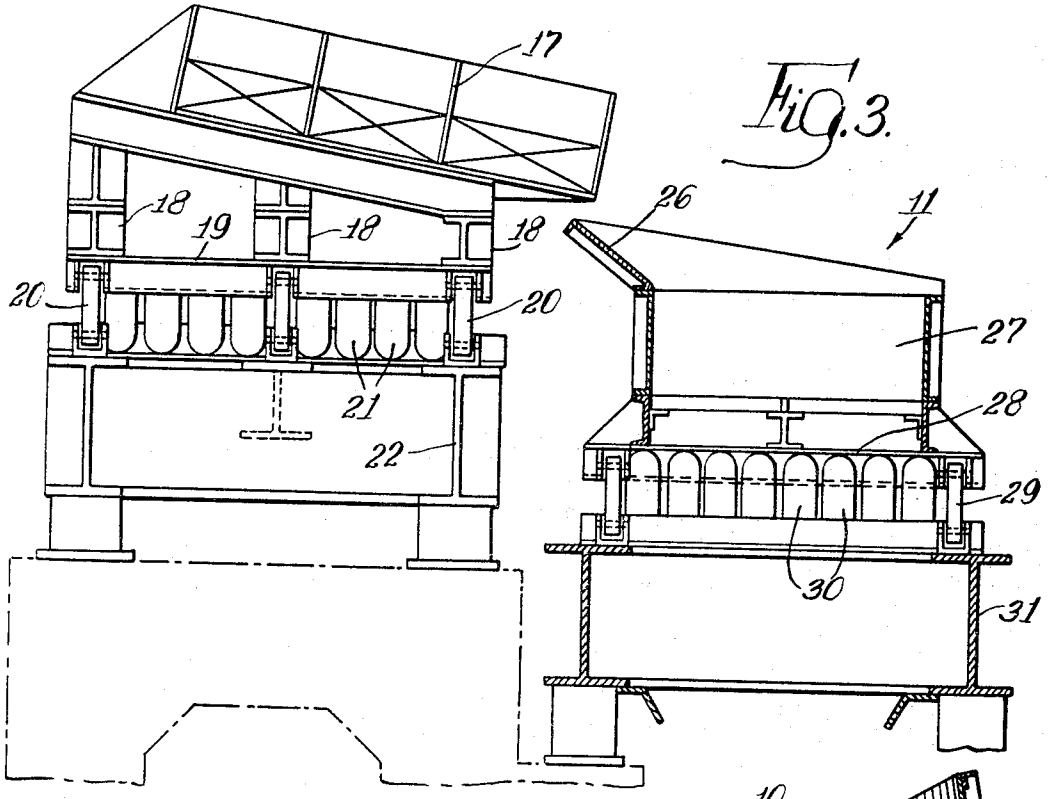
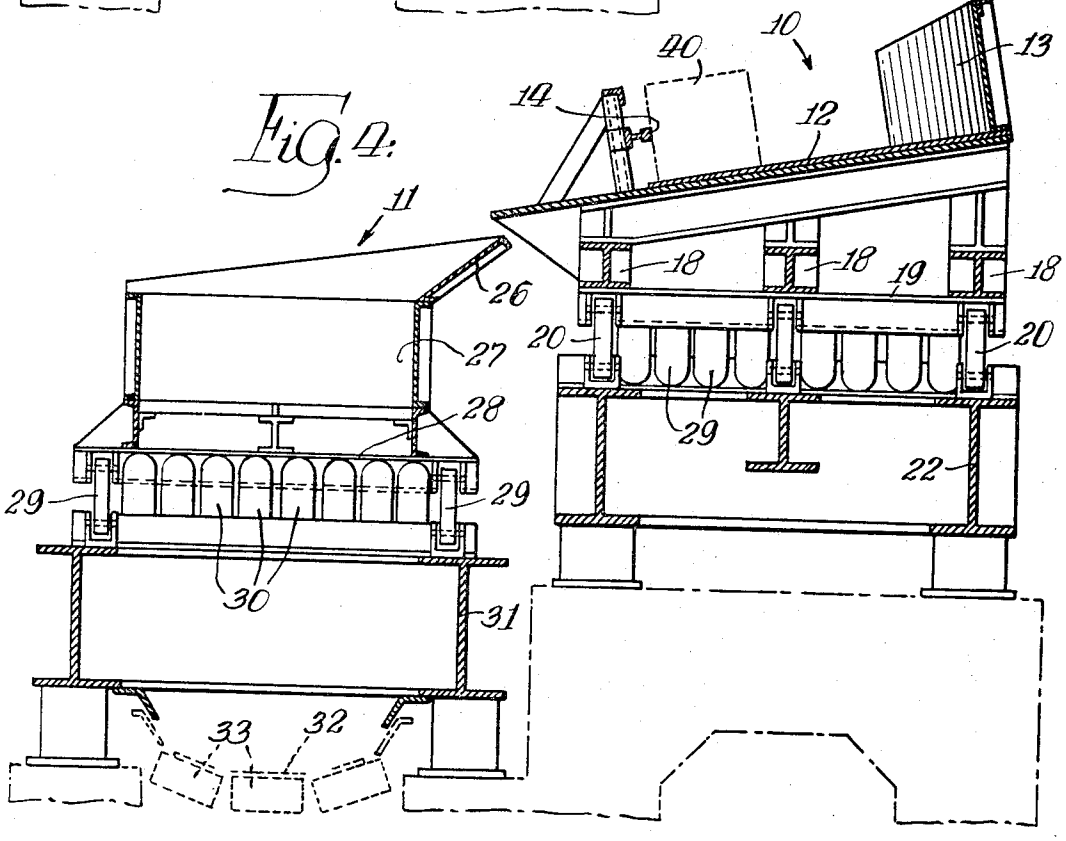


Fig. 4.



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MATERIAL HANDLING APPARATUS

Albert Musschoot, Barrington, and Marvin G. Thomson, Prospect Heights, Ill., assignors to General Kinematics Corporation, a corporation of Illinois

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2 Claims. (Cl. 15—94)

ABSTRACT OF THE DISCLOSURE

The present apparatus provides a vibratory conveyor for large castings, which conveyor serves to orient the castings in a predetermined alignment, to separate said therefrom, and to convey the castings to a desired point of delivery. Additionally, the invention provides means for receiving the sand expelled from castings, for breaking up any lumps from the sand, and then conveying the sand to a desired point.

This invention relates to material handling apparatus and more particularly to an apparatus specifically designed to handle castings immediately after their ejection from a casting flask, with the apparatus serving the additional purpose of separating the sand from the casting and rendering the former suitable for reuse in the foundry process.

It is a general object of the present invention to produce new and improved material handling apparatus of the character described.

Modern foundries are coming more and more to the utilization of automatic molding machines as a step looking to the ultimate automation of foundry casting processes. The size of molds used for castings is constantly increasing as the art progresses, and better apparatus for handling the castings direct from the mold is required. Additionally, it is desirable that means be provided for rendering the sand used in the casting process, and which is ejected from the flask along with the casting, reusable in the foundry process and thus reduce the cost of operation.

It has been the practice to eject a casting and its accompanying sand on a horizontally oriented vibrating deck having perforated holes in its bottom. This system has not been completely successful inasmuch as in many cases the sand is in the form of hard lumps of a size greater than the size of the perforations and hence the lumps are not passed therethrough nor is the sand rendered reusable. Additionally, the former equipment moved the castings to the end of the shake-out bed in completely disoriented and random fashion.

According to the present invention, however, there is provided an apparatus which completely separates sand from the casting even though the sand be in the form of relatively large lumps, and which furthermore not only reduces the lumps to reusable size, the apparatus also orients the castings as it delivers them to the delivery end of the apparatus so that they may be handled thereat by other automatic devices.

Other and further objects and advantages of the invention will be readily apparent from the following description and drawings, in which:

FIG. 1 is a composite side elevational view partially broken away for clarity of illustration of an apparatus embodying the invention;

FIG. 2 is a top plan view of the apparatus shown in FIG. 1;

FIG. 3 is a vertical section taken along line 3—3 of FIG. 1; and

FIG. 4 is a vertical section taken along line 4—4 of FIG. 1.

While this invention is susceptible of embodiment in

many different forms, there is shown in the drawings and will herein be described in detail a specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings there is shown an article conveyor **10** positioned adjacent a sand conveyor **11** with the article conveyor including a longitudinally extending conveyor bed **12** transversely inclined as shown particularly in FIGS. 3 and 4. A wall **13** extends along the upper edge of the bed **12** with the wall inclining inwardly as shown. Positioned along the lower edge of the bed **12** is a perforate article arresting means in the form of a rail **14** with the rail being arranged so as to retain articles on the bed **12** while permitting sand particles and lumps to pass therebeneath.

Castings ejected from a flask are placed upon the bed **12** at a "punch out" location **15** at one end thereof and are moved by means hereinafter described along the bed to a "push off" area **16** where they may be pushed off to be received by subsequent article handling means. An end rail **17** locates the end of the push off area.

The bed **12** is supported upon vertical frame members **18** and horizontal frame members **19** with the latter being mounted for vibratory conveying movement on pivoted arms **20** and coil springs **21**, the latter items being secured to a base member **22**. As seen in FIG. 1, an electric motor **23** is provided to drive by means of a belt **24** an eccentric shaft **25** secured to the frame members **18** so that rotation of the motor and hence rotation of the shaft causes vibratory movement of the bed **12**.

The sand conveyor is provided with a lip **26** underlying the lower edge of the bed **12** so as to direct sand passing under the rail **14** into a hopper **27**. Sand in the hopper drops downwardly into a sand lump breaker **28** of the type described and claimed in our copending application Ser. No. 382,875 filed July 15, 1964 now Patent No. 3,335,861, issued Aug. 15, 1967. As illustrated herein, the lump breaker **28** is supported for vibratory movement on pivoted arms **29** and coil springs **30** in turn supported on base member **31**. Sand passes through the lump breaker **28** where the lumps are retained and broken into smaller portions by vibratory movement of the lump breaker so that eventually sand particles drop through the lump breaker **28** onto a conveyor belt **32** mounted on rollers **33** which convey the sand to a place of storage for reuse. The lump breaker **28** is vibrated as described in said copending application by means of an electric motor, drive, and eccentric shaft, similar to the system **23–25** described above. Any sand which does not fall over the lower edge of the inclined bed **12** is conveyed to the end thereof where it falls into a chute **35** which connects with the upstream end of the sand conveyor **11**.

In operation, the casting indicated as **40** in FIG. 4 is lowered vertically onto the punch out area **15** and hence is conveyed to the push off area by the vibratory conveying action of the bed **12** which vibrates in the direction indicated by the arrow **41** in FIG. 1. The vibratory movement causes the casting not only to move toward the push off area but to slide to the lower portion of the bed **12** at which it is arrested by the rail **14**, which arresting movement of course orients the casting in the manner shown. The vibratory movement shakes sand loose from the casting and drops it from the bed over the lower edge thereof into the sand conveying apparatus **11**. Any lumps in the foundry sand are broken up by said vibratory movement and thus the sand is rendered suitable for reuse.

When the article arrives at the push off area **16** it is, of course, not only positioned against the rail **14** but it is also oriented relative thereto so as to be accurately

aligned for pickup by other material handling apparatus.

The particular apparatus illustrated handles automobile engine cylinder blocks, castings of some considerable size, and the particular shape of the wall **13** has been designed so as to orient the cylinder blocks lengthwise. The particular location and configuration of the wall **13** may be changed when castings of different shape or size are to be handled.

We claim:

1. Apparatus for separating sand from a cast article comprising a longitudinally extending conveyor, means supporting the conveyor in a transversely inclined position, article arresting means extending along the lower edge of the conveyor, said article arresting means being perforate to permit sand to pass therethrough, means positioned below said lower edge to receive sand passing through the arresting means, a second longitudinally extending conveyor extending parallel to the first mentioned conveyor and positioned below said sand receiving means, means for vibrating the first mentioned conveyor along a path inclined thereto to convey sand-bearing articles from one end of the first mentioned conveyor toward the other end and to separate sand therefrom, and a sand lump breaking apparatus positioned intermediate said sand receiving means and said first mentioned conveyor.

2. Apparatus for separating sand from a cast article comprising a longitudinally extending conveyor, means supporting the conveyor in a transversely inclined position, article arresting means extending along the lower edge of the conveyor, said article arresting means being perforate to permit sand to pass therethrough, means positioned below said lower edge to receive sand passing through the arresting means, means for vibrating the conveyor along a path inclined thereto to convey sand-bearing articles from one end of the conveyor toward the other end and to separate sand therefrom, and vibratory sand lump breaking apparatus positioned intermediate said lower edge and the said receiving means, said receiving means including a second conveyor to carry screened sand to a collector.

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WALTER A. SCHEEL, *Primary Examiner.*

LEON G. MACHLIN, *Assistant Examiner.*