ABSTRACT: The disclosure relates to an assembly to receive a core or mold from a foundry machine and to move it gently onto a conveyor. The core may be dropped by gravity onto a series of fingers held in a core-receiving table and then this table drops downwardly to gently place the core on a ribbon-type conveyor. The table moves downwardly about twice as far as the conveyor to achieve this gentle transfer and to get both the conveyor and the table with its fingers out of the way of the foundry machine and its succeeding cycles of operation. Both the core-receiving table and the conveyor move along a vertical path with a common motive means for the two.

The foregoing abstract is merely a resume of one general application and is not a complete discussion of all principles of operation, applications or methods and is not to be construed as a limitation on the scope of the claimed subject matter.
CORE RECEIVER ASSEMBLY

This is a division of Application Ser. No. 735,867, filed June 10, 1968, now U.S. Pat. No. 3,540,608.

BACKGROUND OF THE INVENTION

Many different types of foundry machines for making cores or molds have been utilized in the past. In this specification the term core will be used to mean either a core or mold in the strict foundry sense. As more automatic machinery is preferred because of the increasingly higher labor costs, it is increasingly desirable to automatically remove the cores from the vicinity of the foundry machine and to convey them to other machines in the foundry. The cores are generally fragile just after being formed because fast cycle times are desired and a minimum of time for the core to set or otherwise become hard enough to handle is provided. If a longer time were provided this would not be an economical use of the automated machinery and production floor space.

In the past when a worker manually removed the core he used heat insulating gloves and could grasp the core and use human intelligence to gently pull the core loose or to receive it as it dropped into his hands and would grasp it on the less delicate portions of the mold so that the chance of breakage was minimized. In previous attempts to discharge the core automatically such core often had to drop, sometimes falling over on its side or sometimes dropping a considerable vertical distance onto a relatively hard surface and this greatly increased the chance for breakage of fragile projections on the core.

In many previous foundry machines where automatic discharge of the core was attempted it was required that the core drop a considerable distance because the receiving device such as a conveyor could not be put close to the foundry machines else it would interfere with the proper operation or subsequent movement of parts of the foundry machine.

Accordingly an object of the present invention is to provide a core receiver assembly to gently receive a core.

Another object of the invention is to provide a core receiver assembly to receive a core on fingers held in a table with these fingers moved downwardly to smoothly transfer the core to a core receiver assembly to gently receive a core.

Another object of the invention is to provide a core receiver assembly wherein a core receiver table is moved upwardly and then downwardly a given distance to receive and then transfer the core to a conveyor which is moved upwardly and downwardly without said given distance.

Another object of the invention is to provide a core receiver assembly having a single motive means to move both a core receiver table and a conveyor which subsequently receives the core.

Another object of the invention is to provide a core receiver assembly which moves in a vertical plane without having any vertical stops.

The invention may be incorporated in a core receiver assembly comprising, in combination, a frame, a core-receiving table, first and second linkage assemblies, each said first and second linkage assembly including, a lever-link having first and second ends and a midpoint, means to move said midpoint of said lever-link through an arc, a guide in a first plane on said frame, a rolling and sliding pivot on said first end of said lever-link pivotally and slidably moving along said guide, and a pivotal connection between the second end of said lever-link and said core-receiving table whereby as said lever-link midpoint is moved in one direction in said arc said core-receiving table is moved a given distance in a second plane generally perpendicular to said first plane.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an end elevational view of a machine incorporating the invention.

FIG. 2 is a top view of the machine of FIG. 1 with the conveyor mostly cut away; and

FIG. 3 is a side view of FIG. 1, partly in section.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The figures of the drawing show a preferred embodiment of the invention but such disclosure is merely by way of example and is not to be taken as limiting, the invention being defined only by the appended claims. The Figures of the drawing show a core receiver assembly 10 which includes generally a conveyor 11, a core receiver table 12, first and second linkage assemblies 13 and 14, respectively, and a frame 15. The first linkage assembly 13 includes generally a first lever 17, a flat lever-link 18 and a first support 19. Similarly the second linkage assembly 14 includes a second lever 21, a second lever-link 22 and a second support 23. The frame 15 may generally be considered as a fixed frame although in this preferred embodiment it is mounted on wheels 25 which may run on tracks 26 so that the entire core receiver assembly 10 may be removed from beneath a foundry machine 28, shown in phantom, which makes the cores or molds 27. In this specification the word core will be used to mean either a core or mold in the strict foundry practice sense. The foundry machine may be designed to eject vertically downwardly the core or cores 27 with the cores receivable on fingers 29 of the core receiver table 12 and to subsequently transfer such core onto the conveyor 11 as both the conveyor 11 and table 12 descend. To accomplish this transfer the first and second linkage assemblies 13 and 14 provide for a vertical movement of the core receiver table 12 a given distance and provide for vertical movement of the conveyor 11 about half this given distance.

The conveyor 11 and receiver table 12 are shown in full lines in the lower limit positions thereof and phantom line positions 11' and 12', respectively, show these two parts in the upper limit positions thereof.

To accomplish this movement of the core receiver table 12 and the conveyor 11, a motive means is provided in the form of a fluid piston and cylinder 31. Two such cylinders 31 may be provided for symmetry, see FIG. 2.

The first and second linkage assemblies 13 and 14 are identical with the second being a mirror image of the first for ease of operation by the fluid cylinder 31 and for compactness of the assembly. Accordingly only the first linkage assembly 13 will be described in detail. The lever 17 is a bellcrank lever having an intermediate point 34 pivoted on the frame 15. This bellcrank lever 17 has a first end 35 pivoted to the midpoint of the lever-link 18 at a pivot point 36. The lever 17 also has a second end pivoted at 37 to one end of the piston and cylinder 31. The lever-link 18 has first and second ends 38 and 39, respectively, and the first end 38 carries a roller 40 which is a rolling and sliding pivot between guides 41. These guides 41 are established in a first plane which is horizontal in this preferred embodiment. The second end 39 of the lever-link 18 is pivoted at 42 to the core receiver table 12. The support 19 has first and second ends 45 and 46, respectively, with the first end 45 connected to be moved by the arcuate movement of the lever 17. To achieve this the first end 45 is pivoted at the same pivot 36 which is the pivotal interconnection of lever 17 and lever-link 18. The second end 46 of the support 19 extends generally vertically which is also generally parallel to a second plane perpendicular to the first plane. The support 11 has two sides each of which is pivotally connected to the respective supports 19 and 23. This pivotal connection on the support 19 is at a pivot point 47 near the second end 46, and at pivot 48 to the support 23.
A stabilizer bar 50 is provided between the first and second linkage assemblies 13 and 14. One end is connected to the lever 17 at a point midway between the pivots 34 and 37 and the other end is connected to an extension 51 of the second lever 21 to assure that the two levers 17 and 21 may move concurrently at the same rate and thus establish movement of the core receiver table directly along the second plane. This is a horizontal position and thus the core receiver moves vertically. The lever 17 first end 35 moves in an arc with a lower limit position shown in solid lines in FIG. 1 and shown in phantom lines for the second limit position. This is a 90° arcuate movement as established by a lower limit stop 52 and an upper limit stop 53. The lever 17 first end 35 travels from a lower limit position of about 45° below the horizontal through a horizontal position and then returns back through a horizontal position back to the lower limit position. Accordingly the arc of movement 55 is generally parallel to the second plane and hence generally parallel to the path of movement of the pivot 42. Also the arc 55 is the mirror image of the arc 56 of the pivot 57 which connects the lever 21 lever-link 22 and support 23. These arcs 55 and 56 have their convex sides facing each other. These arcs 55 and 56 are generally parallel to the second plane which in turn is vertical. The support 19 has an extension 60. A cross stabilizer 59 is attached to the extension 60 of the support 19 at a pivot point 61 and its other end is attached at a pivot point 62 to the support 23.

OPERATION

The FIG. 1 shows the core receiver assembly 10 in the first or lower plane position and in phantom shows the assembly 10 in the second or upper limit position. To accomplish this movement the motive means or fluid cylinder and piston 31 is moved from its closed position shown to an extended position of the piston. This motive means 31 is free floating with both the right end of the cylinder and the piston rod on the left being movable. Considering only the first linkage assembly 13, the extension of the piston rod acts on pivot 35° to swing it through a 90° arc which motion will be limited by the upper limit stop 53. The bellcrank lever 17 is accordingly pivoted 90° so that the first end pivot point 36 swings through the arc 55 of approximately 90°. This establishes a motive means to move the midpoint 36 of the lever-link 18 through the same arc 55. Because the first end 38 of the lever-link 18 is guided by the horizontal guides 41 to have a rolling sliding pivot in a first or horizontal plane, the second end pivot point 42 of the lever-link 18 moves in a second plane perpendicular to the first plane, namely a vertical plane. The second linkage assembly 14 has an identical and mirror image operation so that the core receiver table 12 moves vertically to the upper limit position shown in phantom lines 12° in FIG. 1. The movement of the two bellcrank levers 17 and 21 to assure that the core receiver table 12 stays horizontal as it is moved vertically. This core receiver table 12 moves a given distance from the lower to the upper limit position.

The conveyor 11 is composed of a series of ribbons or separated belts so that the core receiving fingers 29 may pass upwardly and downwardly between these ribbons to receive the core 27. The conveyor 11 moves approximately one-half said given distance by being connected to the linkage assemblies 13 and 14 at the lever-link midpoints 36 and 57. Because the lever-link first end 40 remains in a horizontal plane while the second end pivot 42 moves through said given distance, the midpoint pivot 36 will move only one-half said given distance. The support 19 are moved upwardly and downwardly in accordance with the arcuate movement of the bellcrank lever 17 and 21. Again considering only the first linkage assembly 13, the first support 19 is generally parallel to the second or vertical plane, but is not quite vertical in the lower limit position shown in solid lines. The width of the conveyor 11 between the pivot connections 47 and 48 thereof to the supports 19 and 23 is such as to establish this support 19 at a small angle B relative to the vertical. When the bellcrank lever 17 has swung through its arc 55 to the upper limit position, the new position of the pivot point 36 will be vertically above its former position and accordingly the phantom line position 19° of the support 19 shows that it will be disposed at the same angular attitude as in the lower limit position. However, at the midpoint of movement of the arc 55, the pivot point 36 will have swung to the farthest left position, as viewed in FIG. 1. At this time the support 19 will be disposed at an angle equal to the small given angle B but disposed on the opposite side of the vertical plane. The stabilizer 59 is attached to the support 19 at pivot point 61 and its other end is attached to the pivot point 62 of the supporter 23. The spacing between the pivots 61 and 47 is equal to the spacing between pivots 62 and 48, with pivot 62 being below the pivot 48 on the support 23. This stabilizer 59 thus maintains the two supports 19 and 23 generally parallel to the vertical plane even though these supports 19 and 23 do change slightly in angular attitude during the arcuate movement of the bellcrank levers 17 and 21. Without this stabilizer 59 the pivot points 36, 47, 48, and 57 could act like a parallelogram linkage which would not be stable and could tend to collapse to one side. The stabilizer 59 prevents this and maintains the conveyor 11 horizontal as it moves directly.

The FIG. 1 shows the angular relationship wherein the first end of the lever 17 is disposed approximately perpendicular to the lever-link 18 in each of the upper and lower limit positions of the core receiver assembly. Also the lever-link 18 is established at approximately a 45° angle relative to each of the first and second planes in each of these upper and lower limit positions of the core receiver assembly 10.

The retraction of the motive means 31 from its extended position to the solid line position shown in FIG. 1 will lower the core receiver table 12 said given distance and will also lower the conveyor 11 at approximately one-half the rate of speed of the table 12 and approximately one-half said given distance. During this lowering, the core 27, which is still somewhat fragile from just having been made in the foundry machine 28, will be gently transferred onto the ribbon conveyor 11. This is because the tops of the fingers 29 in the upper limit position are above the conveyor 11 and descend to a position below the upper run of the conveyor 11 during this descent of both the conveyor 11 and table 12. This descending movement moves the entire core receiver assembly and especially the fingers 29 out of the way of the foundry machine 28 so that it has sufficient room to perform its next cycle of operation which may include a roller movement, for example. Such roller movement could be used to present the core box facing downwardly just above the tops of the fingers 29 in the upper position so that this core 27 is gently ejected onto the conveyor 11 and supported by these fingers 29 in such upper limit position. It will be seen that the preferred embodiment of the invention provides a core receiver assembly which gently receives and moves a core 27 as it is ejected downwardly and transfers this core onto the conveyor 11 in a gentle and smooth action manner as both the conveyor 11 and the table 12 are descending so that fragile portions of the core 27 are not broken and this will increase the total effective productivity of the foundry machine 28.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.
means to move the first ends of said first and second levers through arcuate paths, the arcuate paths of said lever first ends of said first and second linkage assemblies being generally parallel, said first and second supports being positioned substantially parallel to the respective arcuate path and having first and second ends, means pivotally connecting said first end of said first and second supports to the respective first and second levers, means pivotally connecting said conveyor near said second end of said first and second supports to move said conveyor generally parallel to said arcuate paths as said levers are actuated, and a stabilizer interconnecting said first and second linkage assemblies to establish substantially straight line movement of said conveyor.

2. A core receiver assembly as set forth in claim 1 wherein said first ends of said first lever are pivoted to said first end of said supportive supports.

3. A core receiver assembly as set forth in claim 1 wherein said levers are bellcrank levers having an intermediate point pivoted on said frame and having a second end, and means to move said second end of said lever.

4. A core receiver assembly as set forth in claim 3 including a fluid piston and cylinder means to move said second ends of said levers to move said first ends of said supports in arcuate paths.

5. A core receiver assembly as set forth in claim 1 wherein said arcuate paths are mirror images with the convex side of said arcuate paths facing each other.

6. A core receiver assembly as set forth in claim 1 wherein said supports change their angular attitude with respect to each other as said levers are moved through said arcuate paths.

7. A core receiver assembly as set forth in claim 1 wherein said stabilizer is connected between said first and second supports.

8. A core receiver assembly as set forth in claim 7 wherein said stabilizer is pivotally connected to each of said first and second supports at a given spacing above said pivotal connection of the conveyor to said first support and said given spacing below the pivotal connection of said conveyor to said second support to maintain said conveyor moving in a straight line despite changing angular attitudes of said supports as said levers move along said arcuate paths.

9. A core receiver assembly as set forth in claim 1 wherein said first support has a given angular relationship with said second plane with said first lever at one limit position of the arcuate path thereof, and said first support having an angular relationship equal to said given angle on the opposite side of said second plane upon said first lever being at the midpoint of said arcuate path.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,599,778 Dated August 17, 1971

Inventor(s) Hugh A. Bourassa et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet the illustrative figure should appear as shown on the attached sheet.

Signed and sealed this 24th day of September 1974.

(SEAL)
Attest:
McCOY M. GIBSON JR. C. MARSHALL DANN
Attesting Officer Commissioner of Patents