United States Patent [19]

Martin

[11] **3,871,858**

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[54] **GOB SELECTORS WITH CLOSED LOOP SERVO SYSTEM**

[75] Inventor: **John Martin,** Monterrey, N.L., Mexico

[73] Assignee: **Fabricacion de Maquinas,** Monterrey, N.L., Mexico

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[52] **U.S. Cl.** **65/304,** 91/392

[51] **Int. Cl.** **C03b 5/30**

[58] **Field of Search** 65/304; 91/392, 358

[56] **References Cited**

UNITED STATES PATENTS

1,823,062	9/1931	Pleukharp et al.	65/304 X
3,597,187	8/1971	Trudeau	65/304

Primary Examiner—S. Leon Bashore
Assistant Examiner—Frank W. Miga
Attorney, Agent, or Firm—Kemon, Palmer & Estabrook

[57] **ABSTRACT**

For positioning the scoops of a gob selector machine, for example, of the type shown in U.S. Pat. No. 3,597,187, in place of the conventional direct coupled mechanical rotary or oscillatory systems, a hydraulic power boosting system using a programmed pilot stage is used. A contoured cam drives the booster stage through a sensing servo-valve in order to remove heavy mechanical forces from the cam, greatly increase the useful life of the drive system and permit higher speed operation.

3 Claims, 8 Drawing Figures

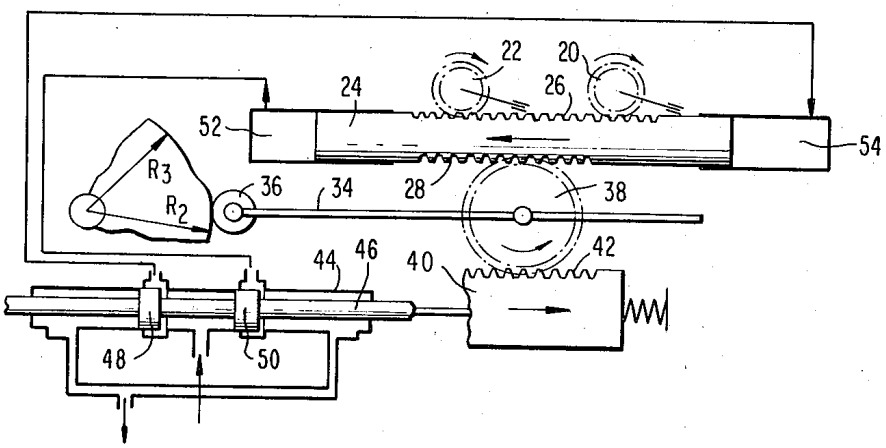


FIG. 2

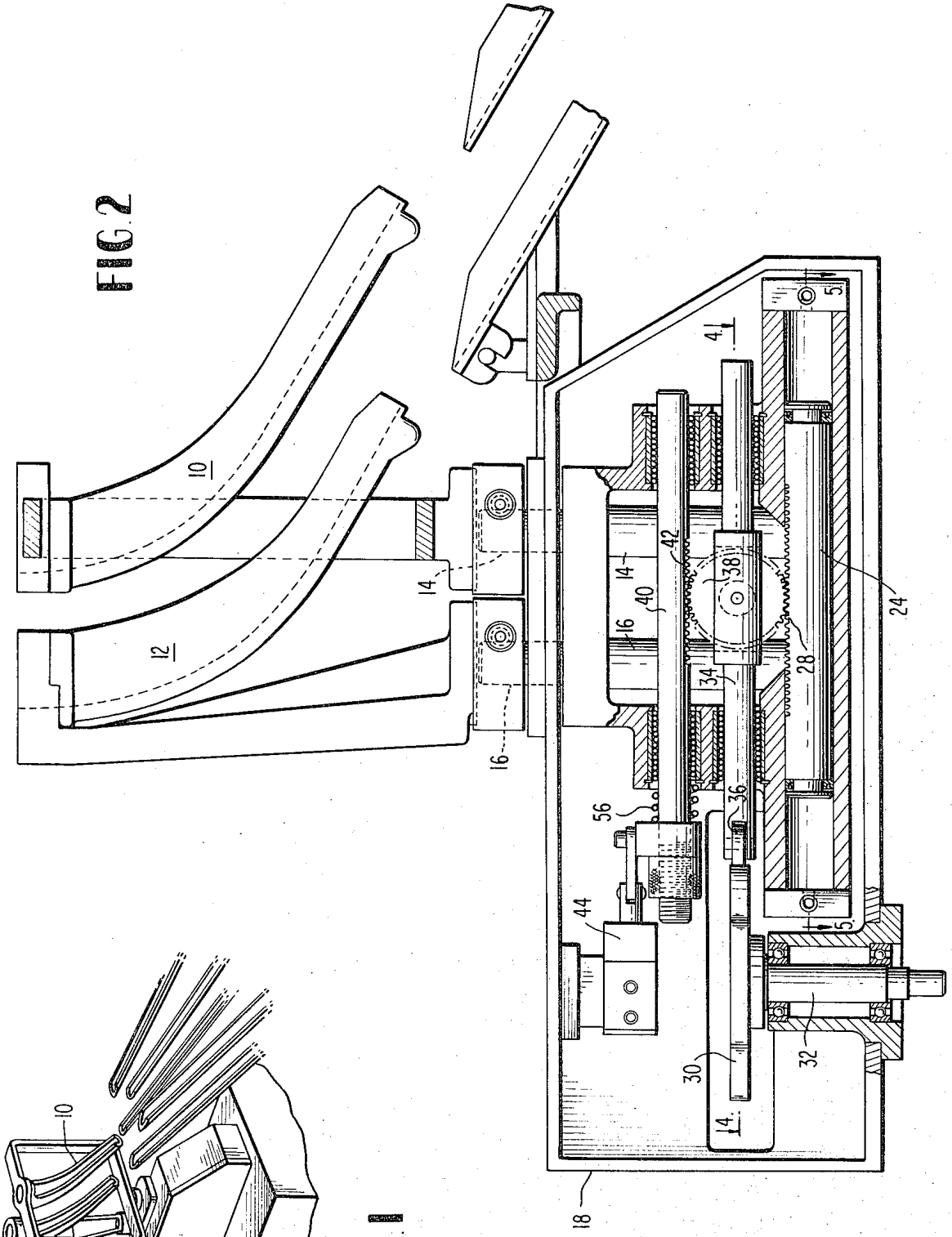


FIG. 1

FIG. 5

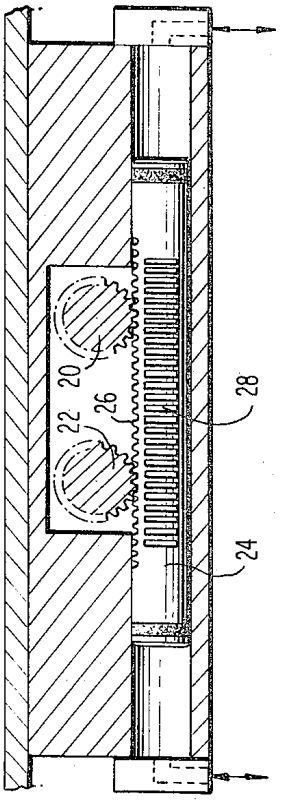


FIG. 4

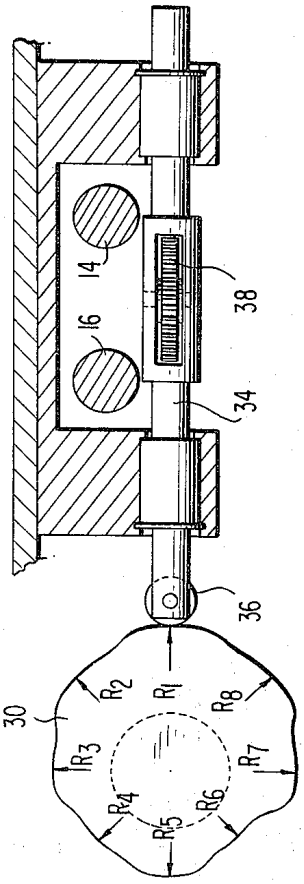


FIG. 3

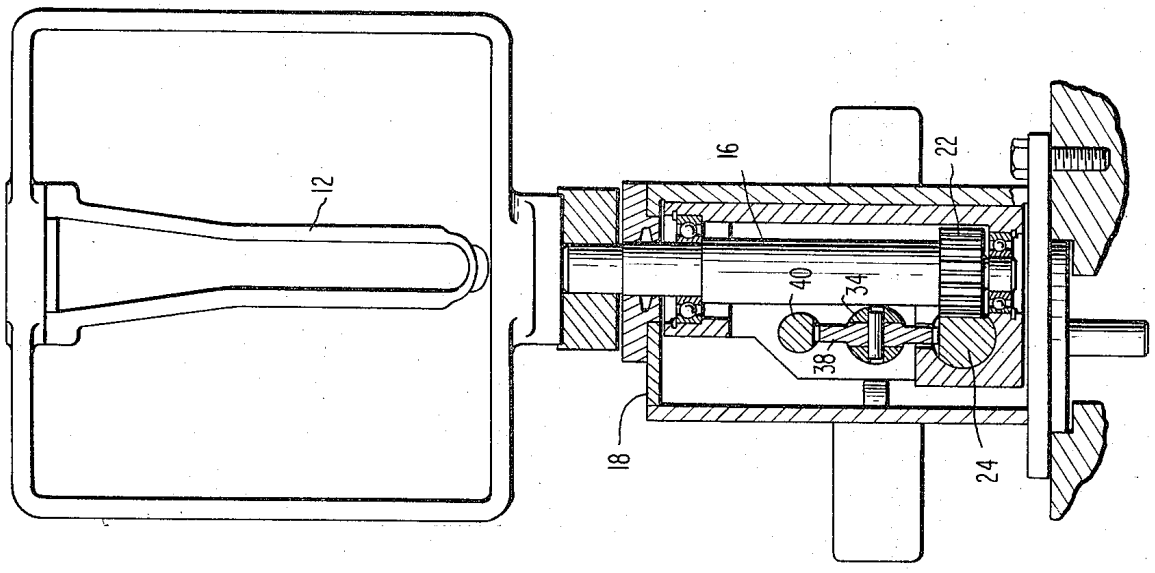


FIG. 6

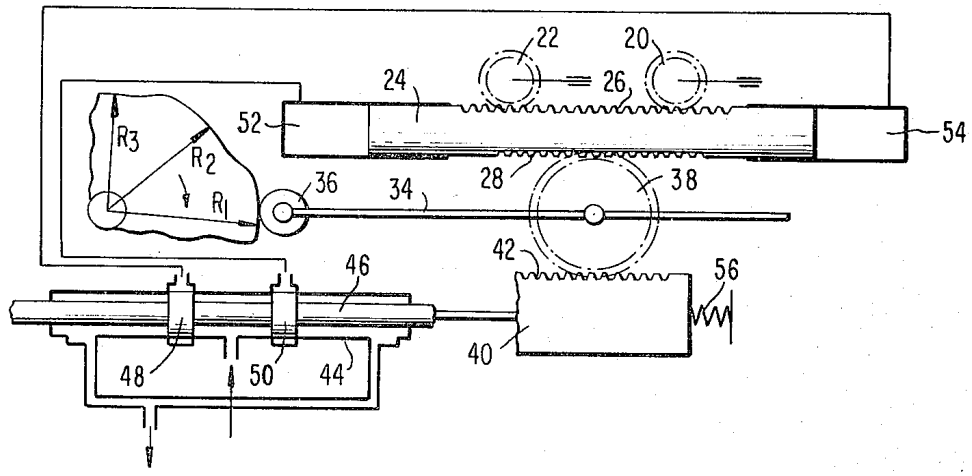


FIG. 7

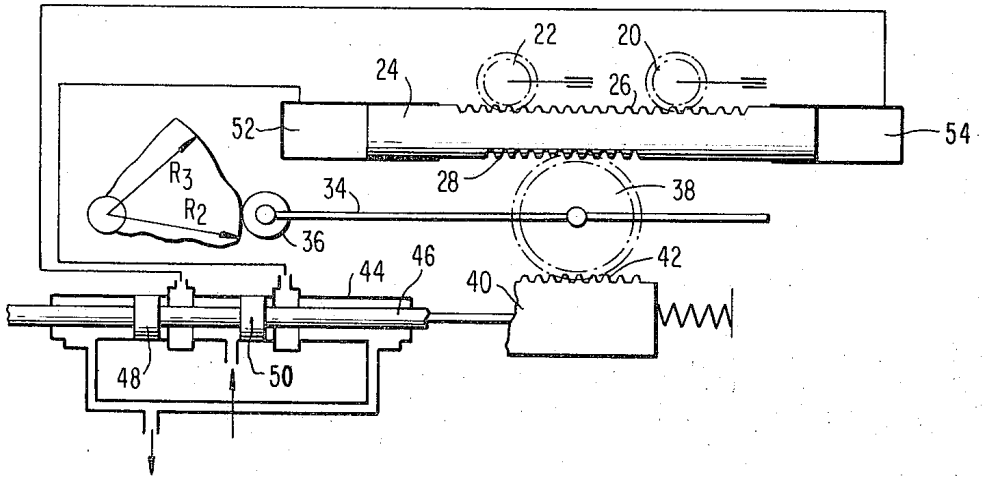
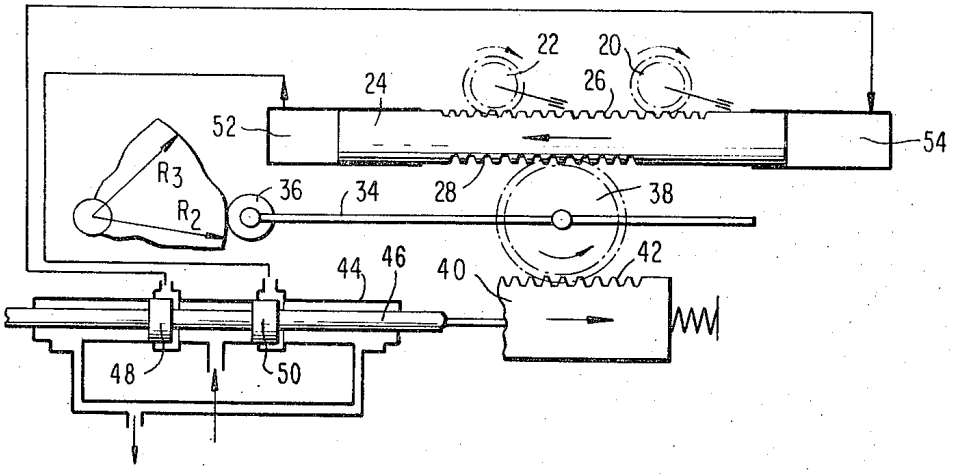


FIG. 8



GOB SELECTORS WITH CLOSED LOOP SERVO SYSTEM

BACKGROUND OF THE INVENTION AND CROSS REFERENCE TO RELATED ART

Gob selector apparatus of the prior art is typified by U.S. Pat. No. 3,597,187 of **1971.** As shown therein, molten glass gobs issuing periodically from a pair of downwardly directed orifices are directed one at a time to one of a plurality of pairs of chutes extending downwardly to pairs of mold cavities arranged in a straight line. The "firing order" for example, for eight pairs of cavities might be 1, 5, 4, 8, 3, 7, 2, 6, etc. The means directing the molten glass gobs to the desired chutes is a pair of rotatably mounted scoops the upper ends of which remain coaxially aligned with the orifices of the gob former and are oscillated on axes co-axial with the orifices to feed the chutes in the desired firing order. The means for oscillating the scoops as taught in the aforementioned patent includes a rotatable cam and cam follower arrangement, the cam follower being mounted on an oscillatory member carrying a pair of ring gear segments in mesh with pinions carried by shafts mounting the scoops. While this arrangement is effective, there is considerable wear on both the cam and follower member due to loads and the ambient temperatures involved. Also, the amount of power required to drive the cam is quite large and consequently a sizable primer mover is required for the purpose. All of these factors tend to limit the speed of operation.

An additional problem in apparatus of the prior art type occurs whenever there is difficulty with one or more of the molding machines. If the gob selector is permitted to continue operating it means that the molten glass dispersed to the molding machine which is malfunctioning will be wasted. If common glass is being poured there is no problem but if leaded glass is involved it first becomes a factor of considerable financial magnitude because such glass cannot be collected and reheated to produce glass of the same quality. What is required is a change of cams to prevent dispensing by the gob selector to the malfunctioning machine. Unfortunately, with machines of the prior art changing the cam is an operation of major proportions requiring substantially a whole working day.

BRIEF SUMMARY OF THE INVENTION

The present invention substitutes for the cam and follower direct drive arrangement of the prior patent, a servo-hydraulic booster arrangement which reduces cam loading to an insignificant value, greatly prolongs the life of the apparatus as a whole, and permits increased speed of operation.

In addition, by simply removing two bolts, the cam of the present invention can be very quickly changed to prevent waste of expensive glass in the event of malfunction of one or more of the molding machines being fed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the oscillating scoops of the present invention together with some of the glass guiding chutes;

FIG. **2** is a side elevation partially in section of the apparatus shown in FIG. **1**;

FIG. **3** is a rear elevation of the apparatus shown in FIG. **1**;

FIG. **4** is a partial section on the lines **4—4** of FIG. **2**;

FIG. **5** is a sectional view of the lines **5—5** of FIG. **2**; and

FIGS. **6, 7,** and **8** are diagrammatic views useful in describing the operation of the servo booster system.

DETAILED DESCRIPTION OF THE DRAWINGS

The scoops **10** and **12** shown in perspective view in FIG. **1** are mounted on shafts **14** and **16** respectively which extend through the upper wall of the housing **18** which encloses the components of the hydraulic servo booster system as well as the gearing which interconnects the drive system and the scoop shafts. As in the aforementioned U.S. patent, the "firing order" is determined by the cam or other pattern control member which controls the instantaneous position of the shafts **14** and **16** and therefore of the scoops **10** and **12.**

As shown most clearly in FIGS. **3** and **5,** a pair of pinion gears **20** and **22** are secured to the lower ends of shafts **14** and **16** respectively. A reciprocating piston **24** has two sets of rack teeth, **26** and **28** and the former engage with the pinion gears **20** and **22.** The longitudinal position therefore, of the piston **24** is what determines the position of the shafts **14** and **16** and their respective scoops **10** and **12.**

The drive apparatus of the present invention employs a circular cam **30** continuously driven by a prime mover, not shown, through shaft **32.** An arm **34** mounted for reciprocation parallel to piston **24** carries at one end, a roller cam follower **36** which is always in engagement with periphery of the cam **30.** Substantially at the mid-section of the reciprocating arm **34,** there is a pinion gear **38** mounted for free rotation on an axis which is at right angles to the axis of reciprocation of the arm **34.**

As shown most clearly in FIG. **2,** another reciprocating arm **40** which is parallel to and spaced vertically upwardly from the arm **34** carries on its undersurface a set of rack teeth **42.** The teeth **28** and **42** of the piston **24** and arm **40** respectively, mesh with the teeth on the pinion gear **38** on opposite sides thereof.

The left hand end of the arm **40** as viewed in FIG. **2** is connected to drive a spool valve, the housing for which is indicated at **44,** in FIG. **2.** This valve is interconnected with and controls the fluid pressure in the space at opposite ends of the piston **24** in a manner which will be described with reference to the diagrammatic showing of FIGS. **6, 7** and **8.**

In FIGS. **6, 7** and **8** the spool valve **44** is shown as including a valve rod **46** carrying a pair of valve members **48** and **50.** FIG. **6** illustrates the neutral position of the servo system in which fluid flow either into or out of the chambers **52** and **54** at opposite ends of the piston **24** is blocked. This means that the piston **24** is effectively locked in the position shown in this figure and consequently the spouts are also locked because they are geared to the piston **24** through the pinions **20** and **22** on the lower end of shafts **14** and **16.** A biasing force is applied to the valve rod **46** from the member **40** by means of a spring **56** the exact location of which is shown in FIG. **2.** FIG. **7** shows the parts in a position which would not actually be achieved in practice but which will help to describe the operation of the system. Referring to FIG. **7,** the cam **30** has rotated clockwise

to a position where the radius R2 which is shorter than the radius R1 is presented to the cam follower **36.** The spring **56** urges the spool valve to the left and also forces the cam follower **36** to remain in contact with the cam because the member **24** remains locked in the position shown in FIG. **6.**

With the valve in the position shown in FIG. **7,** fluid pressure will be applied to the right hand end of piston **24** causing it to move to the left as shown in FIG. **8** and rotating the two pinion gears **20** and **22** in a clockwise direction. At the same time, the gear **38** is rotated in a counter clockwise direction which in turn moves the member **40** to the right which moves the spool valve back toward the neutral position of FIG. **6.**

The foregoing description is not entirely accurate, but serves to illustrate the basic relationships between the various moving parts of the system. In actual practice, the spool valve would never reach the extreme position illustrated in FIG. **7** because as soon as it begins to move to the left, the ports communicating with opposite ends of the pistons **24** would be cracked open and the piston **24** would almost instantaneously begin moving to the left thereby initiating movement tending to keep the spool in neutral position. As those skilled in the art will readily recognize, the above described interconnection between the piston **24** and the piston **40** which always tends to return the spool valve to its initial position means that this is a closed loop hydraulic servo system. The only load on the cam **30** is that necessary to operate the spool valve **44** and the actual movement of the scoops is effected by hydraulic pressure acting on opposite ends of piston **24.**

While a preferred embodiment has been herein shown and described, applicant claims the benefit of a full range of equivalents within the scope of the appended claims.

I claim:

1. Apparatus for simultaneously distributing a pair of mold charges being fed from a double orifice glass feeder to the double cavity blank molds of a plurality of glass forming machines comprising a pair of elongated, curved deflector scoops, means supporting said scoops in generally side by side relationship, each scoop being formed with an open, upwardly facing receiving end in co-axial alignment with one of the feeder orifices only and a lower end, a pair of rotatably mounted shafts one rigidly attached to each of said scoops repectively each of said shafts having a pinion gear rigidly attached thereto;

gear means engaged with said gears and movable to rotate said shafts in synchronism;

fluid pressure means for moving said gear means in opposite directions depending on the direction of application of fluid pressure;

valve means for controlling the admission of fluid under pressure to said fluid pressure means;

continuously rotatable cam means for controlling the position of said valve; and

means interconnecting said cam means, said fluid pressure means said gear means and said valve in a closed loop servo system so that any movement of said gear means in response to movement of said valve means tends to return said valve means to its initial position.

2. Apparatus as defined by claim **1** in which said gear means comprises a first rack mounted for reciprocating movement and terminating at opposite ends in pistons received within fluid filled cylinders, said fluid pressure means is a source of fluid under pressure and said interconnecting means includes a second rack parallel to and spaced from said first, a reciprocating arm parallel to said racks driven by said cam and carrying a pinion gear meshing with both racks and a link between said second rack and said valve.

3. In gob selector apparatus of the type which operates in conjunction with a molten glass feeder having a plurality of bottom outlet orifices from which separate mold charges are discharged simultaneously and which includes means for distributing charges for delivery by gravity to plural cavity-blank molds of a series of machines, plural mold charge deflecting scoops equal in number to the number of said orifices, said scoops being supported in such a position that each scoop extends from beneath one of said orifices and is movable selectively into alignment with said charge distribution means, the upper end of each scoop always being coaxially aligned with and beneath its respective orifice, means for oscillating said scoops in step by step fashion said means comprising:

a pair of rotatably mounted shafts, one rigidly connected to each of said scoops and extending downwardly therefrom parallel to each other;

a pair of gears, one rigidly attached to each of said shafts respectively;

a first rack member having teeth in mesh with both said gears and mounted for reciprocating movement to effect rotation of said shafts and consequent positioning of said scoops, said rack having pistons at each end received within fluid filled cylinders;

a second rack mounted for reciprocating movement parallel to and spaced vertically from said first rack;

an arm mounted for reciprocation between and parallel to said racks and having a gear rotatably mounted thereon and meshing with the teeth of both racks;

a rotatably driven cam for continuously changing the position of said arm with respect to said racks; and

a spool valve connected to be reciprocated by said second rack and having a first pair of ports, one connected to each of said cylinders respectively, said spool being such as to simultaneously close and open said ports, said valve also having an inlet port between said first pair of ports affording connection to a source of fluid under pressure and a pair of interconnected outlet ports spaced outwardly of said first pair of ports.

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