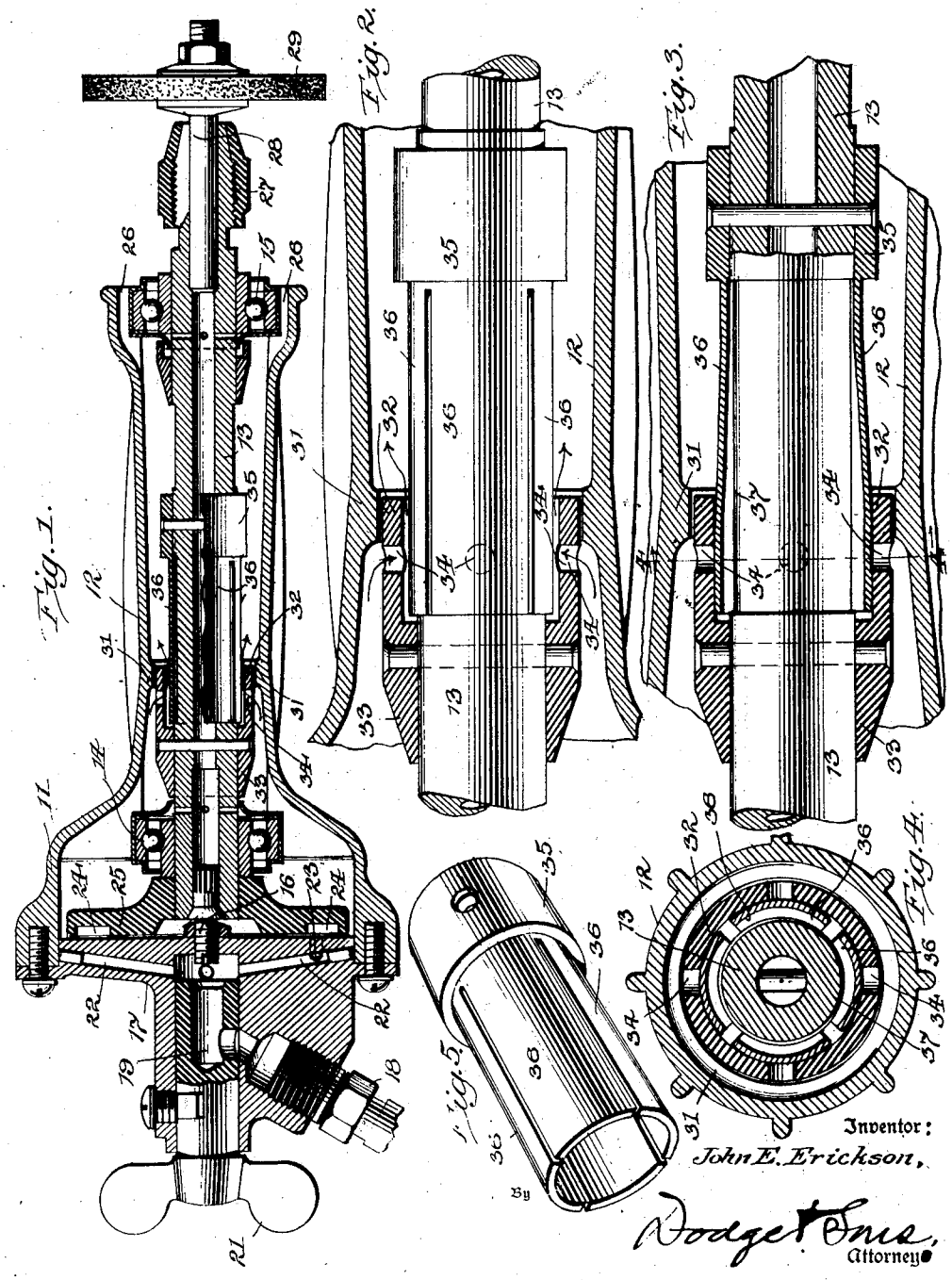
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GOVERNOR FOR FLUID MOTORS

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Fig. 6.

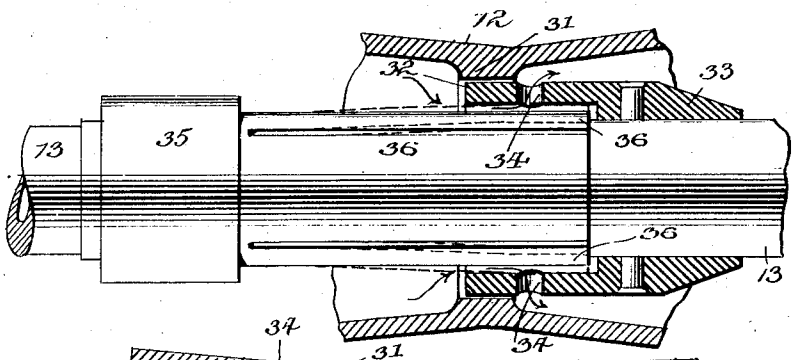



Fig. 7.

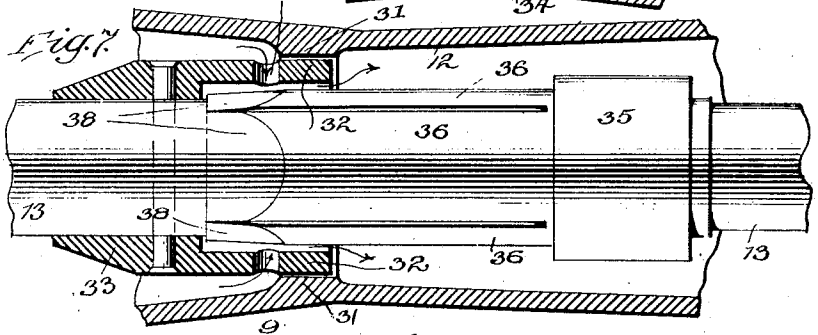



Fig. 8.

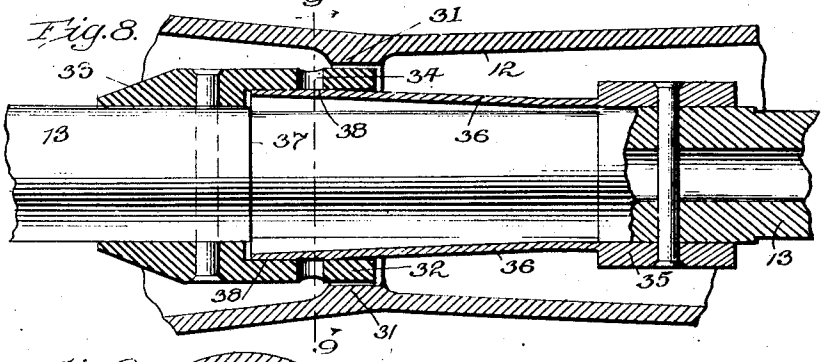
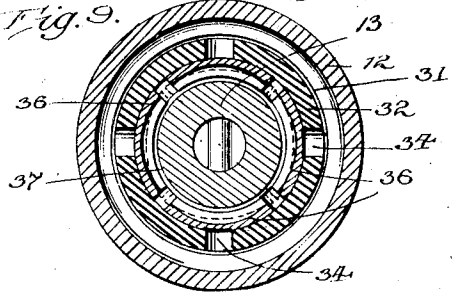



Fig. 9.




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# UNITED STATES PATENT OFFICE

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## GOVERNOR FOR FLUID MOTORS

Application filed January 16, 1932. Serial No. 587,111.

This invention relates to centrifugal throttling governors particularly intended for use with rotary air driven grinders, but susceptible of a much wider application.

As illustrated, the governor is arranged to throttle the exhaust flow from an air turbine, but so far as the governor is concerned the inlet flow might be regulated. The governor may be used also with a considerable range of pressure fluids.

A feature of particular importance is the fact that the governor is formed exclusively of metal.

Other features to which importance is attached reside in the form and arrangement of the parts to simplify manufacture and maintenance and ensure uniform governing characteristics in devices manufactured on a mass production basis. Experience shows that the governor will regulate a motor running at 28000 R. P. M. to within 1000 R. P. M. (or about 3.6%).

The preferred embodiment of the invention as applied to an air driven grinder of known type is illustrated in the accompanying drawings, in which:—

Fig. 1 is a longitudinal section through the grinder (assumed to be at rest);

Fig. 2 is an enlarged fragmentary view of the governor as it appears in Fig. 1;

Fig. 3 is a view similar to Fig. 2, but illustrating the position assumed by the governor fingers when the grinder overspeeds;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of the flexible finger unit;

Fig. 6 is a view similar to Fig. 2, showing a modification;

Figs. 7 and 8 are views similar to Figs. 2 and 3 showing another modification;

Fig. 9 is a section on the line 9—9 of Fig. 8, the normal position of the governor fingers being indicated in dotted lines.

Referring first to Fig. 1, the casing of the grinder includes an enlarged body 11 in which the turbine wheel is enclosed and a concentric slender extension 12, through which the exhaust flows and in which the hollow drive shaft 13 is concentrically mounted.

The shaft 13 turns in ball bearings 14 and 15 of the annular type and is supported by a conical thrust bearing 16 mounted on the removable head 17. The thrust bearing is adjustable.

The air supply connection is shown at 18 and flow is controlled by a swiveled valve or cock 19 actuated by finger piece 21. After passing valve 19, the air passes through passages 22 to nozzles 23, through which it is discharged against buckets 24 formed in the flat face of the runner 25 of the turbine. The runner 25 is fixed on shaft 13.

The air discharges around the periphery of runner 25, flows through the annular space between the shaft 13 and tubular extension 12 and passes to atmosphere through ports 26.

The shaft 13 carries a chuck 27 which receives stems 28 on which grinding wheels such as 29 are mounted.

The grinder above described is now in commercial use and well known.

To govern the rotary speed of such grinders, it has heretofore been proposed to throttle variably the fluid (exhaust air) flowing through the extension 12. The present invention operates on that general principle.

Within the extension 12 an annular rib 31 is formed. This is circular on its inner margin and embraces closely, but without actual contact, a cylindrical skirt 32 projecting from a hub 33 tightly fixed on shaft 13. There is an annular series of ports 34, four being shown, which extend through the skirt 32 and form the sole path for fluid flow, except for such leakage as occurs between skirt 32 and rib 31.

Also fixed on shaft 13 is a second hub 35 from which extend slender flexible fingers 36 whose free ends project within the skirt 32. There is one finger 36 for each port 34, and, when the fingers 36 are flexed outwardly, they throttle or close corresponding port 34 which they overlie.

The hub 35 and fingers 36 are integral and a convenient way to form this part is to machine the hub with a slender tubular extension or sleeve, and then slot this sleeve. The shaft 13 is reduced beneath the fingers as indicated at 37 (see Fig. 3) to afford clearance

for any oil or solid particles which might accumulate and tend to limit the inward motion of the fingers.

Figs. 3 and 4 show the fingers 36 in their outermost position, and Fig. 4 indicates that they do not conform strictly to the internal curvature of skirt 32.

If such conformity is found important in a particular case, the fingers are locked in an expanded condition and then machined to the internal curvature of skirt 32. This produces the modified structure of Figs. 7 to 9 in which the taper at 38 shows the effect of the final machining step. Fig. 9 illustrates the complete contact thus secured between the fingers and skirt.

The modification in Fig. 6 involves merely the reversal of the skirt and fingers relatively to the direction of flow. Such an arrangement is entirely operative, but it is considered better to oppose inward flow of the pressure fluid to the outward centrifugal tendency of the fingers.

Various modifications are possible without departure from the invention.

What is claimed is:—

1. In a governor for pressure fluid actuated motors, the combination of a tubular casing through which actuating pressure fluid flows; a haft arranged to be driven by a governed motor and extending coaxially through said tubular casing; a member fixed on said shaft to rotate therewith and substantially filling the annular interval between the shaft and casing, said member being ported to permit passage of the major portion of said fluid therethrough; and a resilient metal means also mounted on said shaft to turn therewith and adapted to be flexed by centrifugal force to obstruct passage of fluid through said ported member.

2. In a governor for pressure fluid actuated motors, the combination of a tubular casing through which actuating pressure fluid flows; a shaft arranged to be driven by the governed motor and extending coaxially through said tubular casing; a member fixed on said shaft to rotate therewith and substantially filling the annular interval between the shaft and casing, said member having ports through which the major portion of said fluid flows; and a plurality of flexible metallic fingers also mounted on said shaft to turn therewith and adapted to be flexed by centrifugal force into obstructing relation to said ports.

3. The combination of claim 2 further characterized in that there is a flexible finger corresponding to each of said ports.

4. In a governor for pressure fluid actuated motors, the combination of a tubular casing through which actuating pressure fluid flows; a shaft arranged to be driven by the governed motor, and extending coaxially through said tubular casing; a member fixed on said shaft to rotate therewith, said member having a hollow skirt interposed between the casing and the shaft which at its margin is juxtaposed to said casing, said skirt having ports through which the major portion of said pressure fluid flows; and a plurality of flexible metallic fingers each fixed at one end to said shaft and projecting at its free end into said skirt, said fingers when flexed by centrifugal force serving to throttle said ports.

5. The combination of claim 4 further characterized in that the pressure fluid in passing through said ports flows toward the axis of the shaft.

6. The combination of claim 4 further characterized in that the interior surface of said skirt is a surface of revolution, and the free ends of said fingers are so formed that when the fingers are flexed into contact with the inner surface of the skirt they conform substantially thereto.

7. The combination of claim 4 further characterized in that the fingers, when in their unflexed condition, are substantially parallel with the surface of the shaft and spaced therefrom.

8. The combination of claim 4 further characterized in that said fingers take the form of an integral longitudinally slotted sleeve extension on a hub connected with said shaft.

In testimony whereof I have signed my name to this specification.

JOHN E. ERICKSON.